Bangtail Mountains
Allotment Management Plan Update
Environmental Assessment

Bozeman Ranger District
Gallatin National Forest
Bozeman, Montana

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CHAPTER 1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

The Bozeman Ranger District (the District) of the Gallatin National Forest is proposing to update the Allotment Management Plans on five livestock grazing allotments in the Bangtail Mountains in Gallatin and Park Counties, Montana in 2010 (figure 1). Before these plans can be updated, the District is required under the National Environmental Policy Act (NEPA) to complete a public involvement, review, and disclosure process that evaluates and documents the environmental effects of grazing and associated activities. This environmental assessment (EA) in conjunction with public comment and other legal requirements will be used to decide what level of livestock grazing, if any, should be allowed on these allotments.

Livestock grazing has been a part of the cultural and economic life of Montana for over 100 years. Part of the incentive for establishment of the original Forest Reserves was to regulate livestock grazing and other uses of natural resources. The livestock industry has grazed domestic livestock on the lands included in these allotments probably since the late 1800s. Since this time there have been many changes in the type of livestock grazed, seasons of use, the economics of the industry, and the public perceptions of grazing on public lands.

1.2 Purpose of and Need for Action

The Gallatin National Forest Plan (Forest Plan) was developed and approved in 1987. The Forest Plan (as amended) provides the current approved direction for management of the Gallatin National Forest and includes how livestock are managed and where livestock can be grazed. Overall goals of the Forest Plan are to maintain or improve the forage resource and provide for a small increase in livestock grazing (Forest Plan p. II-1). The Forest Plan also sets forth standards and guidelines that contribute toward achieving these goals and assuring that favorable and sustainable rangeland conditions exist into the future. The Forest Plan divides the Forest into Management Areas and provides resource management direction for each of those areas.

All of the Forest Plan Management Areas in the Bangtail Mountains allow the grazing of livestock. While these management areas all permit grazing, they do not recommend specific livestock numbers, types of livestock, grazing seasons, or the types of grazing-related management activities that will occur on each allotment. It is therefore the purpose of this proposal to decide those questions while providing the livestock industry the opportunity to graze livestock under permit as directed in the Forest Plan.

This proposal is being considered at this time because of the need to evaluate the conditions of several resources on the allotments and address any disparities between the Forest Plan standards, and existing management and environmental conditions (Public Law 104-19, Section 504(a) (1994)). An interdisciplinary team (ID Team) of Forest Service resource specialists assigned to evaluate this proposal identified three existing conditions threatening the sustainability of resources

on these allotments. The ID Team identified them as priorities needing to be addressed. Livestock grazing can affect all of these conditions (Chapter 3.0):

- Reduced Stream Form and Function
- Reduced Riparian Vegetative Health
- Noxious weed and invasive non-native plant establishment

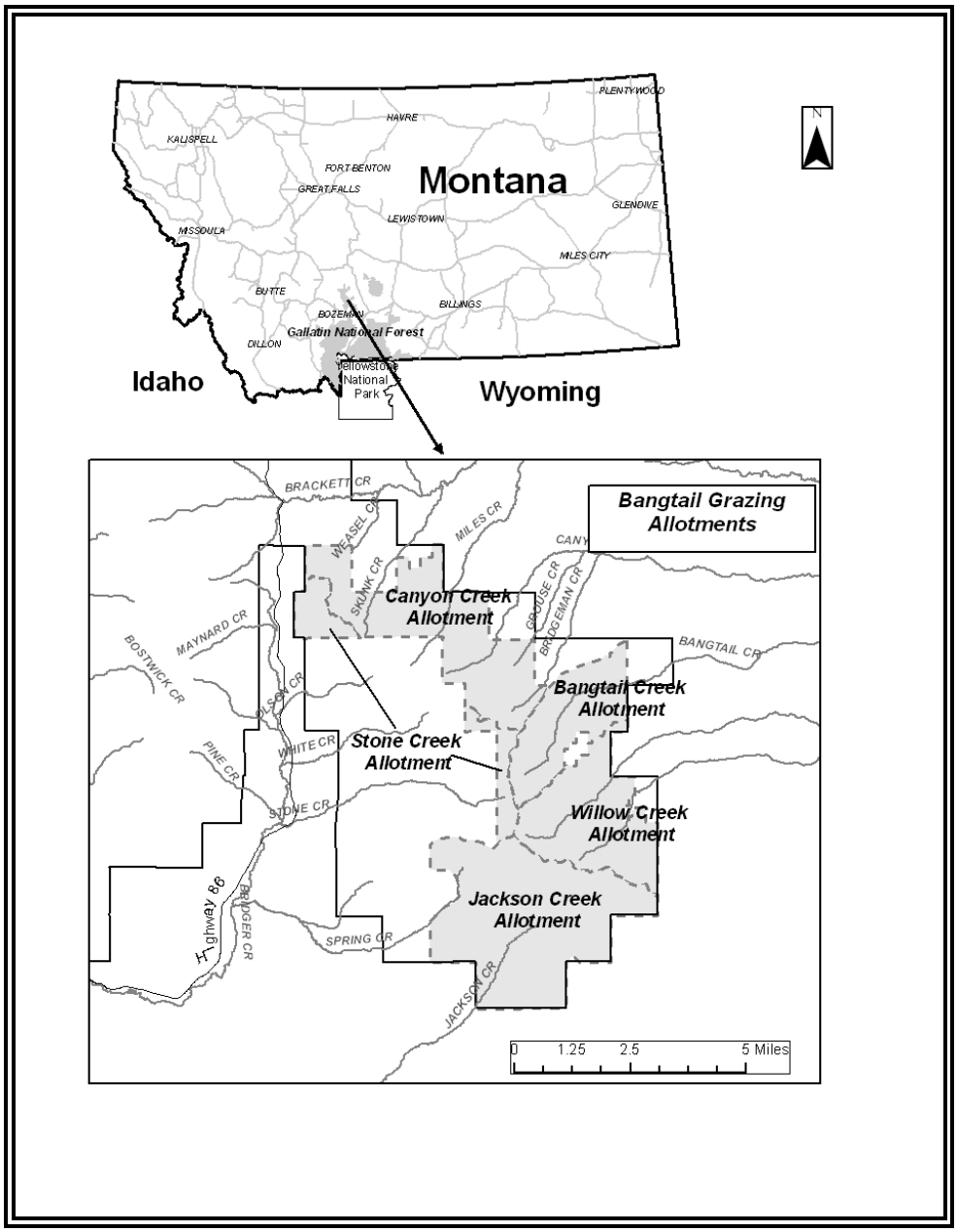


Figure 1. Vicinity map of Bangtail Allotments

1.3 Forest Plan Desired Future Conditions

At the Forest level, the Gallatin Forest Plan has desired future conditions (DFCs) for livestock that state:

> "Improved range management practices will be initiated to improve wildlife habitat in livestock grazing allotments on wildlife winter range and riparian areas (Forest Plan II-12)."
>
> "Livestock grazing is expected to increase slightly in the first decade. This increase will be accomplished through more intensive management on existing allotments and possible initiation of stocking on a few new allotments. This increase could be from 43,000 AUMs to 44, 900 AUMs and will be accomplished to protect or enhance other resource values" (Forest Plan II-13).

1.4 Proposed Action

The proposed action is called Alternative 2 or the "No Action" alternative meaning the District is proposing to implement the current grazing strategies. These are displayed in the following table 1. A map of the allotments is displayed in Appendix 1, Map 1.

Activities associated with livestock grazing on these allotments includes the maintenance of fences, water developments, fenced riparian exclosures, the placement of minerals, livestock herding, issuance of annual operating instructions and utilization inspections by the permittee and the Forest Service.

Table 1.1. Bangtail Allotments. Grazing seasons and numbers of livestock.

Allotment Name	*Type of Grazing System*	*Permitted Livestock Numbers Under Term Permits*[1]	*Permitted Livestock Numbers Under Private Land Permits*[2]	*Season of Use*
Stone Creek	Deferred Rotation	14	90	7/1-9/30
Canyon	Deferred Rotation	104	N/A	7/1-10/5
Bangtail	Deferred Rotation	135	15	7/1-9/30
Willow Creek	Deferred Rotation	117	83	7/6-10/5
Jackson Creek	Deferred Rotation	111	107	7/8-9/22

[1] Indicates cow-calf pairs unless otherwise stated. Cow/calf means each cow is assumed to have one calf. This is the number of livestock that the National Forest lands are able to support.

[2] This is the number that the private land portion of the allotment is able to support in addition to those on the National Forest. Private land is grazed in common (not separated by a fence) with the National Forest System lands.

Two other alternatives were also analyzed. Alternative 1 proposes no grazing and Alternative 2 proposes to implement an adaptive management approach to grazing. All the alternatives are discussed in more detail in Chapter 2.

1.5 Scope of the Environmental Analysis

The scope of this analysis is limited to the effects associated with livestock grazing and associated activities on the Canyon Creek, Stone Creek, Bangtail Creek, Willow Creek, and Jackson Creek grazing allotments. The scope includes National Forest System Lands and those private lands that are managed as part of the grazing allotment whose management related to grazing has been waived back to the Forest Service (Appendix 1, Map 1).

1.6 Decision to be Made

The deciding official for this project is the District Ranger. The District Ranger's decision will be disclosed in a Decision Notice. In the Decision Notice the District Ranger will decide which of three alternatives described in Chapter 2.0 to implement . Alternative 2 is the proposed action and since management would not change compared to current grazing strategies it is also called the "No Action Alternative"; alternative 1is the 'No Grazing Alternative". Which as the name implies would not graze any livestock; and, Alternative 3 the adaptive management alternative. Alternative 3 would potentially implement most of the Management Actions listed in Chapter 2.9 with exceptions such as prescribed burning which would take additional analysis, public input and disclosure through the NEPA process.

If Alternative 2 is chosen, grazing of livestock would continue as is with no changes with the permit being reissued for another ten years.

If the District Ranger chooses Alternative 1, livestock would be removed from all five allotments. Implementation of this alternative would also include removing improvements such as fences, water developments, corrals, and any other structures related to livestock grazing from the National Forest.

CHAPTER 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Contents of Chapter

Chapter 2 documents the issues that are important to this analysis and also issues that were dismissed from further analysis. This chapter also describes alternatives eliminated from detailed evaluation, contains a detailed description of the proposed action, describes alternatives to the proposed action, and provides a comparative summary of the environmental effects associated with each alternative (40 CFR 1502.14).

2.2 Public Involvement

One of the first steps in completing the environmental analysis was to determine the main issues (40 CFR 1501.7) which then become the focus of the analysis. They guide the evaluation of the environmental effects and help the deciding official decide on a preferred alternative. Issues are identified through a process called "scoping". Scoping this project included mailing information about the proposal to 75 members of the public, non-profit organizations and government agencies in October 2008. Four comment letters were received in response to this effort. Comments were also solicited from the livestock permittees during annual permittee meetings.

Most comment letters provided recommendations related to how the District should conduct the effects analysis, and suggested that the District follow the laws and policies governing management of National Forests. As part of this project, the District intends to comply with all Forest Service Policies, laws, and direction for management of National Forest resources and uses of National Forest System Lands.

2.3 Issues Dismissed from Further Analysis

The National Environmental Policy Act provides for the identification and elimination from detailed study issues which are not relevant or which have been covered by prior environmental review. This narrows the discussion to a brief statement dismissing those issues or a statement providing reference to their coverage elsewhere (40 CFR 1501.7(3)). The following issues were dismissed from further analysis (Project File-Scoping, Content Analysis).

Amphibians

No comprehensive amphibian survey(s) have been conducted within the Bangtail Mountains. During allotment reviews, fisheries surveys, and other project related work, Columbia spotted frogs have been observed and reported throughout the Bangtail Creek and Willow Creek drainages. No northern leopard frogs or western boreal toads were observed within the project area. Northern leopard frogs were observed by Shepard (2004) north of Brackett Creek in the Horse Creek drainage at about the same elevation band as most of the drainages described above. Montana

Natural Heritage Tracker database includes several records of western toads observed since 1974 in the vicinity of the confluence of the South Fork, Middle Fork, and North Fork of Brackett Creek which is located approximately two mile northwest of the Canyon Creek Allotment. Although none have been observed within the project area, habitat exists for northern leopard frog and western boreal toad. Very few wetlands not associated streams and ponds occur within the project area.

Soil Disturbance

Soil disturbance, including compaction, rutting, soil displacement, and surface erosion were determined to be insignificant because of the timing of the grazing seasons and because effects will be limited to very small areas. Most grazing seasons in the Bangtials do not start until July 1st and the start of grazing in all cases depends on range readiness which could be even later. By the time the range is ready, soils are dry enough that soil compaction and other soil disturbances are not an issue. Impacts to soils are expected to be isolated to small areas less than an acre in size primarily around water developments and mineral placements. One potential exception would be poorly or very poorly drained soils associated with riparian and/or wetland areas. Therefore, the effects on riparian and wetland areas are described and analyzed in Chapter 3 and 4. Past field reviews of the Bangtail Allotments have identified only isolated minor problems with soil disturbance and no problems associated with landslide activity. The potential for soil mass wasting due to livestock grazing was also considered to be insignificant. Land type mapping for the Soil Survey of the Gallatin National Forest (Davis and Shovic 1996) identified no areas or high erosion risk within the allotments on National Forest System lands. None of the activities proposed in any of the alternatives would result in large areas of soil disturbance. Based on the above, soil is not considered to be a relevant issue in this analysis (Project File, Soils Report).

Elk/Livestock Conflict

Competition for forage is sometimes an issue related to livestock grazing. This is particularly true where livestock graze winter range. Most of the winter range in this area is on the east side of the Bangtail Mountains with much of that on private lands. Little of the winter range is in any of the allotments evaluated in this analysis. The District Biologist and Montana Fish, Wildlife and Parks did not identify competition for forage between elk and livestock as an issue. Elk numbers are at or above the population goals set by Montana Fish Wildlife and Parks. There is some separation between livestock and elk due to either displacement or different foraging needs. However, there are many thousands of acres of public lands available for elk that are not grazed by livestock (Chapter 4.7). Livestock grazing does not appear to be affecting elk populations in this area.

Water Quality

Livestock grazing impacts to water quality can include increased stream temperature through removal of riparian vegetation, increased stream sedimentation from bank trampling, and elevated bacteria numbers derived from livestock urine and feces. The decision not to evaluate a water quality issue was based on the determination that the Forest is in compliance within these allotments with Montana water quality laws and regulations. The following discussion supports this rationale.

Water quality can be defined as the biological, chemical, and physical conditions of a waterbody. It is a measure of a water body's ability to support beneficial uses. Therefore, if a stream supports beneficial uses then it meets water quality standards even though there may be some reduced water quality.

Land management activities implemented in the allotments support compliance with Montana water quality law and regulations and include the following three elements:

1. Best Management Practices (Montana BMPs) are being applied;

The Administrative Rules of Montana (ARM 16.20.603) identifies that "land management activities must not generate pollutants in excess of those that are naturally occurring", regardless of the stream's classification. "Naturally occurring" is defined in the ARM as "…the water quality condition resulting from runoff or percolation over which man has no control or from developed lands where all reasonable land, soil, and water conservation practices (Best Management Practices have been applied". The "Watershed Management Guidelines for the Gallatin National Forest" (Glasser 1987), and Soil and Water Conservation Handbook (FSH 2509.22; 5/88 & 4/95) list the BMPs currently used on the allotments to protect beneficial uses.

2. Beneficial uses are not impaired;

Administrative Rules of Montana (ARM 16.20.604) classify all waters within the five allotments as B-1 (Chapter 3.2) suitable for multiple uses including domestic water supply after conventional treatment. The B-1 classification includes cold water fisheries, commonly mountain or foothill streams that support trout and associated fishWater quality standard violations by livestock grazing in Montana are usually associated with feedlots or corrals where livestock are heavily concentrated near streams. These situations do not occur on these allotments. Although some streams are too cold to support a fishery, all others are able to support cold-water fisheries.

3. Monitoring is in place to test whether BMPs are adequate to protect beneficial uses.

Since 1989, the Gallatin National Forest has had an allotment BMP monitoring program as part of implementation water quality monitoring. This monitoring program indicates the implementation of grazing BMPs on the Gallatin National Forest is protecting beneficial uses.

The R1/R4 Stream Sediment Model was used to further assess the maintenance of beneficial uses. The model was used to assess overall watershed condition relative to sediment production for the main sediment generating activities on the Gallatin National Forest, i.e. roads and timber harvest. The analysis concluded that all of the evaluated watersheds on these allotments are well in compliance with Gallatin National Forest sediment standards at the 6th Code HUC (sub-watershed) level. These standards were developed in coordination with the Montana Department of Environmental Quality. The sediment modeling indicates that roads are the primary human-caused sediment source in the Bangtail Allotments with very limited additional sediment from timber harvest areas, which have largely recovered.

While the sediment model does not directly evaluate sediment generation from livestock grazing, these activities are thoroughly evaluated for their site-specific effects through assessments including stream channel geometry measurements, channel typing, proper functioning condition, pebble counts, stream width/depth ratios, and channel stability ratings (Chapter 4.0).

The data used in the model reflects existing road and timber harvest unit conditions (Chapter 3.2). Sediment modeling results are in Chapter 3.2, table 3.4. The sediment model included all existing roads, timber harvesting, and residential, and recreational developments for all land ownerships. The model compares relative differences among alternatives rather than predicting precise sediment and water yields that are likely to occur upon project implementation.

Because the R1/R4 model relies on climatic conditions averaged over long periods, the model's accuracy is best when averaged over several years. The model is less reflective of individual drought or flood years. The R1/R4 sediment model focuses on slope processes and estimates the water and sediment delivered to the main channel by forest management within the watershed, including the headwater stream channels. However, the movement of sediment and water through the main channel is limited to broadly-based regional curves as no main channel hydrologic or hydraulic processes are modeled directly (Project File – Hydrology and Fisheries Report).

Because best management practices are being applied, beneficial uses are not being impaired, and monitoring is in place to test whether BMPs are adequate to protect beneficial uses, water quality was not evaluated as an issue.

Potential Effects on the Endangered Canada Lynx

All alternatives considered would be consistent with laws, regulation, policy and direction currently in place for Threatened and Endangered (T&E) species. Threatened and Endangered species are largely absent from the Bangtail Range. Therefore, there are few immediate consequences associated with any of the alternatives. Given the relatively small isolated nature of the Bangtail Mountains and marginal subalpine forest habitat for lynx it is likely that any future occupation of this range by these species would occur at very low levels compared to elsewhere on the Gallatin Forest. Since the U. S. Fish and Wildlife Service (USF&WS) considers the Bangtail Mountains as unoccupied by lynx a Biological Assessment for this project would determine that the proposed action would have no effect on any threatened or endangered species, and therefore there is no need for consultation with the USF&WS for this project. A more detailed analysis of T&E species is contained in the project files describing these conclusions (Project File - Wildlife Report). Therefore, this issue of potential effects on T&E species was not evaluated.

Potential Effects on the Sensitive Grizzly Bear, Gray Wolf, Bald Eagle, Wolverine, Trumpeter Swan, Black-backed Wood Pecker, Peregrine Falcon, Western Big-eared Bat, Flammulated Owl and Harlequin Duck

The grizzly bear, gray wolf, bald eagle and peregrine falcon were all previously protected under the Endangered Species Act. As populations recovered, these species were removed from the Endangered Species List ("delisted") and automatically added to the Forest Service Sensitive Species List. A literature review and analysis was conducted by the District Biologist to consider

the effects on sensitive species. This analysis determined there are no effects on the grizzly bear, gray wolf, bald eagle, wolverine, trumpeter swan, black-backed woodpecker, peregrine falcon, western big-eared bat, flammulated owl, and harlequin duck. This determination was based on either the lack of suitable nesting, breeding, rearing, and foraging habitat in the area or that livestock grazing would have no direct, indirect or cumulative effects on nesting, rearing, breeding and foraging habitat requirements for these species. Therefore, effects on these species were determined not to be relevant to the analysis (Project File-Wildlife Report).

Potential Effects on the Pine Marten, which is a Management Indicator Species

None of the literature researched for this report referenced livestock grazing as having negative impacts on martens or their habitat (Buskirk and Ruggiero 1994, Buskirk 1999, Coffin et al. 2002, and Powell et al. 2003). Martens preferentially select dense forest cover types with abundant coarse, woody debris for hunting, traveling, resting and reproduction, while showing a strong avoidance of open areas that provide primary rangeland for livestock. Key marten prey species are most common in mature forest environments. Cattle rarely venture into dense forest stands but rather tend to congregate near forest edges when necessary for thermal regulation. Livestock grazing has no notable effect on marten reproductive or foraging habitat. For these reasons, there are no direct or indirect effects associated with any of the alternatives for livestock grazing in this area (Project File-Wildlife Report).

Sensitive Plants

Sensitive plants are species for which there is a concern for population viability evidenced by significant current or predicted downward trend in populations or habitat (FSM 2672.1). Livestock grazing has the potential to impact plants by physical damage through grazing, trampling, or habitat modification. Modification of the habitat may be by soil compaction, changes in plant composition, or alteration of the soil water regime. Sensitive plants considered in this analysis included nineteen plants known or suspected to occur on the Gallatin National Forest (Project File – Vegetation, Sensitive Species List dated May 4, 2006). The Montana Natural Heritage Database was reviewed for recorded findings of plant species of concern. No plant species of concern are recorded in that database for the Bangtail Mountains. Sensitive plant surveys were conducted between June 12 through August 16, 2007 and no sensitive plants were found (Project File-Vegetation). While no sensitive plants were found, all nineteen plants have the potential to be growing somewhere in the analysis area. Because habitat exists, mitigation is included in the action alternatives to mitigate the potential effects on sensitive plants. This includes conducting surveys prior to grazing related projects that could potentially impact sensitive plants or their habitat (Chapter 2.10). For example, locations for proposed fences, water developments etc. would be surveyed prior to any construction. This mitigation has proven effective in the past. Site-specific reviews of projects have been conducted on a regular basis and is now standard operating procedure. Because no plants were found and because mitigation is included as part of the proposed alternatives, this issue was dismissed from further evaluation.

Conflicts Between the Public and Livestock Grazing

There are some problems on the allotments related to recreation use and livestock being pushed around or even off allotments, fences being damaged, and gates being left open. So far these are minor problems, not widespread, usually not intentional. Implementation of the Forest Travel Plan should eliminate many of the problems. Since the ID Team felt this problem could be resolved or at least substantially reduced it was not evaluated as an issue.

Bangtail Special Interest Area

On June 15, 2007 acting Regional Forester Kathleen McAllister signed the decision to establish the Bangtail Special Interest Area (Bangtail SIA) (Decision Notice and Finding of No Significant Impact and Designation Order for the Establishment of the Bangtail Botanical and Paleontological Special Interest Area 2007). The Bangtail SIA consists of 3,366 acres of land along the main ridge of the Bangtail Mountains in Gallatin and Park Counties. The purpose for the Bangtail SIA is to provide long-term protection to an area for scientific research opportunities on mountain meadow and sub-alpine ecosystems, and to provide research sites for important paleontological resources of North America. An environmental analysis was conducted that concluded livestock grazing would not be a conflict with establishment and intended use of the Bangtail SIA.

Based on the analysis documented in the Bangtail SIA environmental assessment in Chapter 4.4.2, no changes are proposed in the level, duration or timing of livestock grazing (USDA 2007). Therefore, the establishment of the area as a special interest area would not directly affect the grazing of livestock including the operating costs to the permittee. It is possible that if scientific studies are fenced there could be some minor amount of reduction for forage for livestock. However, based on the size of past scientific studies this is expected to be minimal. If a more ambitious study is undertaken then grazing permittees could possibly experience increases or decreases in the number of livestock permitted. This would depend upon the type of study being undertaken. If a scientific study is proposed that requires the permittee to reduce their livestock by more than just a few head then additional environmental analysis and public disclosure would be required as either an environmental impact statement, environmental assessment, or a decision memo (EA Chapter 4.4.2). Livestock grazing would continue as in the past since conflicts between past scientific research projects and grazing has been minimal (EA Chapter 4.4.2). Based on decisions and analysis establishing the Bangtail SIA it was determined that potential conflicts with livestock grazing is not an issue and the integrity of the Bangtail SIA is not at risk.

Other Issues not Evaluated in Detail

Other comments have been submitted by the general public, Federal and State agencies on similar projects nearby. For example, several questions about the Travel Plan and National Forest Access were submitted. However, access is not within the scope of this analysis and was instead decided in the recent Travel Plan decision. Comments related to forest management activities to reduce catastrophic wildfire were submitted but are beyond the scope of this analysis which is focused on livestock grazing. Roadless and wilderness issues were also suggested however, there is no wilderness involved and no roadless areas exist in the Bangtails. It has also been suggested that additional management indicator species be identified. Since management indicator species are

assigned during the Forest Planning Process and not during project proposals this potential issue was eliminated.

The Content Analysis in the Project Record for this proposal tracks all the comments received during scoping and records their disposition (Project File, Content Analysis).

2.4 Relevant Issues from Federal, State, Local Government, and Public Involvement

The following issues were determined to be important to the proposal. These were used to evaluate the environmental effects of each alternative. Each issue has one or more indicators. Indicators are used to measure the effects that each alternative has on the issues and to compare the differences between the alternatives (Chapter 4.0).

2.4.1 Issue: Livestock grazing could affect stream channel form and function and habitat for aquatic species

2.4.1.1 Indicators for Stream Form and Function Direct Indirect and Cumulative Effects

Indicators for Direct and Indirect Effects:

- Response of bankfull width, particle size distribution, and residual pool depth
- Response of stream channels not functioning properly (i.e. functioning-at-risk, and non-functioning)
- Response of streams at greater than 20-point Stream Channel Stability departure (Pfankuch 1975)

Additional Indicators to Evaluate Cumulative Effects

- Miles of road
- Miles of road in stream influence zones
- Number of road-stream crossings
- Logged areas
- Acres of primary rangelands grazed

Issue Discussion for Stream Form and Function: Domestic livestock grazing and associated livestock activities can alter stream channel form and function, especially in more sensitive stream types (Rosgen C, E, and fine-textured B stream channel types, Rosgen 1996) by direct modification of the streambed and banks (e.g. hoof shear) and indirectly by modifying riparian vegetation and sediment delivery regimes. Impacted stream channels may widen and aggrade, or become deeply incised, with associated reductions in important fish habitats such as pools, undercut banks, overhead cover, and spawning areas. Increased sediment delivery may result in increased entrainment of fine sediments (< 6.35 mm) in spawning gravels and fill pools that function as rearing and over-wintering habitats. Increased sediment delivery may fill interstitial (spaces) areas surrounding gravel and cobble substrate that are used by aquatic invertebrates and breeding, rearing, and over-wintering habitat for sensitive amphibians.

Domestic livestock grazing and associated livestock activities can alter the structural and species diversity of riparian vegetative communities. Riparian vegetation modification may directly remove fish security cover and reduce stream shading, resulting in increased water temperatures in summer and colder temperatures in winter. Riparian vegetation modification may indirectly result in reduced streambank stability and sediment filtering capacity of vegetation, both of which can result in increased sediment delivery rates with effects as described below. Riparian vegetation modification may also change stream channel form and function and may modify aquatic food webs and nutrient cycles. Removal of riparian vegetation in amphibian breeding, incubating, and rearing habitats may reduce its suitability for those functions and may increase vulnerability of the amphibians to predation.

It is presumed that if stream channel attributes such as bankfull width, bankfull depth, stream gradient, sinuosity and substrate recover to proper functioning condition that the quality of fish habitat would also improve.

2.4.2 Issue: Livestock grazing could affect terrestrial management indicator species and the overall diversity of animal life.

2.4.2.1 Indicators for Direct, Indirect and Cumulative Effects on Management Indicator Species (MIS) and the Overall Diversity of Animal Life

Management Indicator Species Indicators for Direct, Indirect and Cumulative Effects:

- Goshawks - effects on foraging
- Elk – effects on forage availability and distribution, reproductive, and security habitat
- Impacts on migratory bird nesting and foraging
- Predators
- Biodiversity

Issue Discussion for Terrestrial Life: Wildlife is a high value resource. This Forest is part of the largely intact Greater Yellowstone Ecosystem (GYA). The GYA hosts a complete suite of native fauna, including recovered populations of previously listed threatened and endangered species, currently listed species, Forest Service sensitive species, and other species of special management designation, as well as a wide variety of migratory bird species, big game, small game, furbearers, and other general wildlife species. There is great public interest in federal management actions that have the potential to affect wildlife species or their habitats. Livestock grazing can alter native plant community composition and structure, which could impact terrestrial wildlife.

2.4.3 Issue: Livestock grazing could affect terrestrial plant life including: the composition and successional development of riparian and upland plant communities; the presence of invasive nonnative plants and the overall diversity of plant life.

2.4.3.1 Indicators for Direct Indirect and Cumulative Effects on Riparian Plant Communities

Indicator for Direct and Indirect Effects:

- Qualitative discussion of direct and indirect effects of livestock grazing in riparian areas

Additional Indicators to Evaluate Cumulative Effects:

- Acres of riparian area accessed by livestock
- Acres of riparian areas within 100 feet of roads
- Acres of logging in riparian area

2.4.3.2 Indicators for Direct Indirect and Cumulative Effects on Upland Plant Communities

Indicator for Direct and Indirect Effects:

- Acres of livestock grazing in uplands
- Comparison of Updated Livestock Stocking Levels to Historic Stocking Levels

Additional Indicators to Evaluate Cumulative Effects

- Acres of livestock grazing in uplands
- Acres of road surface
- Acres of logging
- Acres of invasive species
- Acres of prescribed fire
- Conifer encroachment

2.4.3.3 Indicators for Evaluating Direct Indirect and Cumulative Effects of Invasive Non-native Plants and the Overall Diversity of Plant Life

Indicator for Direct and Indirect Effects:

- Qualitative discussion of how livestock grazing would influence the establishment of invasive plants

Additional Indicators to Evaluate Cumulative Risk of Weed Establishment:

- Environmental variables such as slope, elevation, roads, presence of livestock, logging, aspect, etc.

Issue Discussion for Riparian Plant Communities: Livestock grazing has the potential to impact plants by physically damaging the plant through grazing or trampling, or by modifying the habitat in which the species grows. Some plants are tolerant of grazing while others are not. Livestock can preferentially graze certain plants causing a shift in plant community composition and succession. Certain levels of grazing can maintain species diversity of plant communities (Hobbs & Huenneke 1992).

Livestock grazing can alter the structure and species diversity of riparian plant communities. Riparian vegetation modification may directly remove fish security cover and reduce stream shading, resulting in increased water temperatures in summer and colder temperatures in winter. Riparian vegetation modification may indirectly result in reduced streambank stability and sediment filtering capacity of vegetation, both of which can result in increased sediment delivery rates with effects as described below. Riparian vegetation modification may also change stream channel form and function and may modify aquatic food webs and nutrient cycles. Removal of riparian vegetation in amphibian breeding, incubating, and rearing habitats may reduce its suitability for those functions and may increase vulnerability of the amphibians to predation.

Issue Discussion for Upland Plant Communities Grazing alters the appearance, productivity and composition of upland plant communities. Livestock grazing may contribute to a decline in range condition if preferred forage plants are selected and grazed many times during the season and are not provided time to recover. Eventually, individual plants continually grazed become weak, die, and are replaced by more competitive plants such as introduced plants including noxious weeds. Rangelands were rated only fair or good condition because of the amount of noxious weeds and introduced plants present.

Issue Discussion for Invasive Plant Species: Livestock are recognized as one of many pathways contributing to the establishment and expansion of noxious weeds (Olsen 1999, Belsky and Gelbard 2000, National Strategy and Implementation Plan for Invasive Species Management 2004, Freilich et. el. 2003). Invasive plant and animal species have been recognized by the Chief of the USDA Forest Service as one of the four critical threats to the Nation's ecosystems. In response, the Forest Service has taken a leading role in addressing invasive species threats at the local, state, and national levels, as well as internationally. The Forest Service uses a strategic and integrated approach to reduce the threat of invasive species. Forest Service Manual (FSM) 2081.2 provides Forest Service guidance for noxious weed prevention and control. A required practice of FSM 2081.2 is to include a weed risk assessment in environmental analyses for rangeland projects.

Livestock may bring seed into an area either on their coats or in their feces and may create microsites for nonnative seeds to germinate (Hobbs & Huenneke 1992). Disturbances increase resource availability and decrease competition from resident species, thus facilitating the colonization by weedy species with greater competitive abilities than the natives. The amount of bare ground created by soil disturbances has been shown to directly control the abundance of invading species. (Prieur-Richard and Lavorel 2000). The greatest resistance to invasion of nonnative plants was found in highly productive communities with moderate levels of disturbance, which also had the highest number of species present (Prieur-Richard& Lavorel 2000).

2.4.4 Issue: Livestock grazing on public lands and the associated costs could affect livestock operators and the grazing fees collected from permittees may not provide a positive return to the Federal Government.

2.4.4.1 Indicators for Direct Indirect and Cumulative Effects on Economics

Indicator for Direct and Indirect Effects and Cumulative Effects:

- Present Net Value
- Benefit/Cost Ratio
- Potential Affects on Permittee Operations

Issue Discussion for Economics: Since the early 1900s, the Federal Government has collected grazing fees from ranchers grazing livestock on the National Forest. Over the years, this has led to controversy. Advocates of grazing contend grazing on Federal Lands is a productive use of these lands and that it supports local economic development. Opponents contend that grazing damages public resources and expenditures to manage the program do not cover the cost of grazing. According to a Government Accounting Office Study (2005), revenues collected from livestock grazing on the federal lands were less than one sixth of what it costs to administer the grazing program. However, forage provided from grazing permits on federal lands is often a critical part of livestock operations and may keep many operations in business.

2.5 Alternative Development Process

Alternatives were formulated based on; legal requirements, review of relevant issues and those issues that could be resolved through project design and mitigation, field reviews and data collection, reviews of District allotment administration records, meetings with permittees, and ID Team and deciding official review.

A "No Grazing" alternative (Alternative 1) is also included in this analysis to compare the effects of not grazing livestock.

The "No Action" (Alternative 2) is required to be included under the National Environmental Policy Act (NEPA) and serves as a basis for comparison of the alternatives [40 CFR 1502.14(d)]. The "No Action;" alternative typically means the proposed action does not occur. Since livestock grazing has been occurring in this area under permit since the early 1900's a "No Action" alternative is interpreted to mean livestock would continue to be grazed under the current management strategies.

A third alternative would implement adaptive management (Alternative 3). Forest Service direction is to implement adaptive management for range allotments when compatible to on-the-ground resource needs (FSH 2209.13). Based on this direction, the proposed action is based on the concepts of adaptive management (Salafsky et. al. 2001, Nyberg 1998, Lee 1999, Johnson 1999). Specific proposed management actions in Alternative 3 are based on field reviews of a variety of resources including; proper functioning condition assessments, water quality, stream channel alteration, stream morphology, riparian health, range upland plant community conditions, livestock carrying capacities, annual allotment administration data, new rangeland management policies,

court decisions, agency direction, extensive analysis using geographic information system technology, etc. In addition, meetings were held with all permittees on the allotments to review current management. Feedback from the permittee meetings was then used to modify the proposed action Alternative 2.

Incentives for implementing adaptive management include among other reasons: being able to respond more quickly to changes on the landscape; moving allotment management in a positive direction based on feedback from monitoring; and, reducing the amount of paperwork needed to implement changes on allotments. In light of this direction, several publications were reviewed to better understand the concepts of adaptive management (Salafsky et. al. 2001, Nyberg 1998, Lee 1999, Johnson 1999). Using these concepts and direction from the Forest Service Handbook, the ID Team designed Alternative 3.

2.6 Alternatives Eliminated From Detailed Study

Several alternatives were considered but eliminated from detailed analysis. Reasons for dismissing alternatives can include not meeting the purpose of and need for the project; not meeting Council of Environmental Quality (NEPA) guidelines of being reasonable; feasible, and viable; not differing substantially from the other alternatives being analyzed in detail; being beyond the scope of the analysis; and/or not complying with current laws, regulations, policies, or Forest Plan direction.

Close Some Allotments and Leave others Open
One alternative considered would have closed those allotments with riparian grazing problems. However, District field reviews indicated problems are not wide-spread (Chapter 3.2) across all the allotments or even within certain allotments. Livestock-related problems along streams appear to be isolated cases related to livestock distribution that could be improved with changes in such things as watering, and mineral placement, fencing, etc. Since the option of closing allotments to protect riparian areas does not seem necessary at this time, this alternative was not evaluated in detail.

Implement Bank Alteration Standards on all Streams on all allotments
One important issue relates to the effects that livestock have on riparian areas. Therefore, we considered an alternative that would solve this problem by implementing bank alteration grazing standards on all the streams on all the allotments. However, field reviews indicated this is not needed. Many streams have hardened rocky banks, are in dense forests, are surrounded by a lot of downed wood, they are remote, do not have concentrated livestock use or for what ever other reasons experience very limited or no bank trampling. Implementing bank alteration standards take time and money to administer on the part of both the permittee and the Forest Service. Allotment-wide bank alteration standards were not reasonable and therefore we eliminated this as an alternative.

Immediate Fencing of Riparian Areas
One alternative would have addressed the riparian grazing issue by keeping allotment grazing strategies as is but would restrict or eliminate livestock use of all riparian areas by fencing. Riparian fences can be somewhat permanent barbed wire or smooth wire or temporary electric fences. Some have been constructed on the District. They work well but can restrict wildlife from

water, are expensive and time-consuming to maintain, and can shift livestock use to other areas. The option of fencing is included in Alternative 3 as a management action and can be implemented in the future. Therefore, this alternative did not differ substantially from alternative 3 in that respect and was not considered in detail.

Reductions in Livestock Numbers
Reducing livestock numbers is often looked at as the best solution to any grazing problem and the District considered reducing livestock numbers to solve riparian and invasive species issues. However, some literature suggests just reducing livestock numbers does not always solve the problem (Huber et.al. 1995, Marlow 1988)). In addition, historic use levels in uplands appear to be within standards with only minor problems in drought years (District Range Files). Also, updated calculation of grazing capacities conducted as part of this analysis indicates stocking levels are generally within capacities (EA Chapter 3.3). This indicates the problem could be livestock distribution rather than stocking numbers. Distribution can be solved by herding, mineral placement, pastures and water developments, etc. The option of reducing numbers is included in Alternative 3 as a potential management action. Therefore, this alternative did not differ substantially form Alternative 3 in that respect and was not considered in detail.

2.7 Detailed Description of Alternative 1 (No Grazing, Appendix 1- Map 1)

The No Grazing alternative proposes that no livestock grazing occur on any of the allotments. This alternative would respond to the negative issues related to livestock grazing such as impacts to riparian areas, changes in plant communities, economics, and effects on wildlife. Other activities that occur within the area permitted under other decisions would continue. This includes special use permits, motorized and non-motorized trail use, many other recreational activities, trail and road maintenance, logging, prescribed burning, vegetation surveys, wildlife surveys, research, etc.

Activities associated with this alternative would include: removing fences no longer needed for management of the allotments; removal of water developments; removal of all other structural improvements related to livestock grazing. Appendix 1, Map 1 displays the locations of structural improvements removed under this alternative. Table 2.1 lists those allotment improvements that would be removed.

Table 2.1 Improvements to Remove in Alternative 1 (No Grazing).

Allotment	Miles of Fence to be Removed*	Water Developments to be Removed
Canyon Creek	7.4	2
Stone Creek	0.6	3
Bangtail Creek	2.3	4
Willow Creek	0.0	4
Jackson Creek	0.6	6
Totals		

*Miles are based on GIS calculations and may vary from what is actually on the ground.

2.8 Detailed Description of Alternative 2 (No Action, Appendix 1- Map 2)

The no action alternative keeps the grazing strategies as they currently are today. Table 2.2 displays a summary of each allotment. The table displays numbers of pastures, current grazing systems, seasons of use, numbers of livestock, and numbers of permittees on each allotment. Activities that annually occur include: maintenance and construction of fences and water developments; installation of cattle guards; annual permit administration including measuring utilization in riparian and upland areas; meetings with permittees; monitoring of the placement of mineral supplements in relation to sensitive resources; and billing for livestock use. Trailing of livestock into and out of the area at the beginning and end of the grazing season occurs along with herding by the permittee to redistribute livestock during the season. Noxious weed treatment would continue. Appendix 1, Map 2 displays the locations of most activities that taking place under Alternative 2.

Table 2.2 Bangtail Allotments. Grazing seasons and numbers of livestock.

Allotment Name	*Type of Grazing System*	*Permitted Livestock Numbers Under Term Permits*[1]	*Permitted Livestock Numbers Under On/Off Permits*[1]	*Permitted Livestock Numbers Under Private Land Permits*[2]	*Season of Use*
Stone Creek	Deferred	14	0	90	7/1-9/30
Canyon	Deferred	104	0	-	7/1-10/5
Bangtail	Deferred	135	0	15	7/1-9/30
Willow Creek	Deferred	117	83	-	7/6-10/5
Jackson Creek	Deferred	111	0	107	7/8-9/22

[1] Indicates cow-calf pairs unless otherwise stated. Cow/calf means each cow is assumed to have one calf. This is the number of livestock that the National Forest lands are able to support.
[2] This is the number that the private land portion of the allotment is able to support in addition to those on the National Forest. Private land is grazed in common with the National Forest System lands.

2.9 Detailed Description of Alternative 3 (Appendix 1 – Map 3)

The proposed action is based on processes outlined for implementing adaptive management in Nyberg (1999) and Salafsky, et.al. (2001). A first step in the adaptive management process included formulating a mission statement and a target condition (Salafsky, et.al. 2001). The mission statement and the target condition for livestock grazing are based on a review of the Forest Plan goals (Forest Plan Chapter II pp.1-2), desired future conditions (Forest Plan Chapter II pp. 11-13), and objectives (Forest Plan Chapter II pp.2-6) and public scoping. The Mission Statement and target condition are as follows:

> **Mission Statement:** Land Management practices support native terrestrial and aquatic plant and animal life: meet or exceed all legal requirements for water quality; and allow natural ecosystem processes of disturbance and recovery to play a more natural role on the landscape.

Target Condition: Livestock grazing strategies protect and restore stream form and function, water quality, and riparian and upland plant communities while contributing to the economic and social well-being of the local ranching community.

Implementing adaptive management also involves identifying and prioritizing "threats" to the target condition and the overall mission (Salafsky, et.al. 2001). Based on public scoping and internal review by the deciding official and the ID Team, the following three threats are identified as highest priority impediments to meeting the mission statement and the target condition:

- Reduced Stream Form and Function
- Reduced Riparian Vegetative Health
- Noxious weed and invasive non-native plant establishment

The next step involved identifying the various factors that contribute to these threats (Project File IDT notes 5/8/06 and 5/10/06). Table 2.3 summarizes the threats and contributing factors.

Table 2.3 Landscape Threats and Contributing Factors. This table displays the threats determined to be highest priority along with those factors that contribute to them.

Threat	**Contributing Factors***
Reduced Stream Form and Function	Streambank trampling, Improper livestock distribution, Sediment From Roads, Disturbance of native vegetation, Drop in water tables, Unauthorized grazing, Removal of Forest Cover, Natural flooding and High flows, Fire, Recreation, and Drought
Reduced Riparian Vegetative Health	Streambank trampling, Improper livestock distribution, Disturbance of native vegetation, Drop in water tables, Road encroachment, Streams not in PFC, Insects and disease, Wildfire and post fire events, Recreation, and Drought
Noxious weed and invasive non-native plant establishment and distribution (also a Forest Service national priority)	Roads and vehicles, Improper livestock distribution, Livestock transportation of seed, Disturbance of native vegetation, Drop in water tables, Streambank trampling, Wind, Fire, Recreation, Drought

* There may be other contributing factors but these are the ones the ID Team determined were most important.

Management Actions

Once the contributing factors were identified the ID Team drafted the following list of management actions that would address these factors. It should be noted that most but not all contributing factors can be influenced. Wind, for example, plays a role in the dispersal of noxious weed seed but is not something that the District has any control over. Therefore, management actions concentrate on those factors the District can influence within the scope of this analysis. Derivation of the

management actions was done cooperatively with the grazing permittees through a series of meetings (Project File IDT notes). A detailed description of the Management Actions is included in Appendix 2. Appendix 2 also defines the management action, the types of activities taking place required to implement the actions, and provides a prediction of what the District hopes would be the outcome of implementing each management action. Predictions are essential for tracking progress toward objectives and for evaluating management actions (Salafsky, et. al. 2001).

A. Construct exclosures:
B. Implement prescribed fires:
C. Change grazing systems:
D. Decommission roads:
E. Road maintenance:
F. Create or reconfigure pastures:
G. Change the class of livestock:
H. Combine some or all allotments:
I. Change livestock numbers, non use, or removal for resource protection:
J. Instream improvements:
K. Implement updated upland grazing utilization standards:
L. Livestock predation reduction:
M. Control tall larkspur:
N. Change type of fencing:
O. Harden stream crossings:
P. Change trailing routes:
Q. Adjust salt and mineral placement:
R. Noxious weed treatment:
S. Change grazing season:.
T. Change allotment boundaries:
U. Share permit administration with permittees:
V. Build or rebuild a fence:
W. Allow for adequate rest after prescribed or wildfire:
X. Make use of unused grass banks:
Y. Suspension of grazing permit:
Z. Bill permittee for unauthorized use:
AA. Change the type of livestock:
BB. Conduct bank stabilization projects:.
CC. Implement updated riparian grazing guidelines:
DD. Construct water developments/water gaps:
EE. Administer grazing permit to standard:.
FF. Mechanical treatment:
GG. Pick up old fence:
HH. Close allotment
II. Adjust permit for on-off use

Objectives: Objectives are checkpoints used to measure progress toward achieving the target condition (goal) (Salafsky, et. al. 2001). Having Management Actions designed to achieve the goals allowed us to set the following objectives. Each objective has a "Definition of Positive Trend" that determines if we are on track to meet objectives by the desired date. Determination of the trend goes hand in hand with the monitoring plan (Appendix 3).

1. **Attain Annual Operating Plan compliance from permittees by 2011 (Appendix 3, Monitoring Item 3).**

Definition of Positive Trend: Annual administration of the permit would indicate if the permittee is either in compliance or not in compliance. Annual operating plan compliance requires the permittee adhere to such things as; forage utilization standards, bank alteration standards, moving livestock between pastures as required, maintaining fences and water developments, paying grazing fees, etc. A positive trend would be if each permittee were consistently in compliance.

2. **Maintain those riparian systems currently in properly functioning condition. Establish a positive trend toward full restoration by 2020 for those systems that are functioning-at-risk or are non-functioning. Bring all streams into fully functioning condition by 2030 (Appendix 3, Monitoring Item 3, 4, 9, 10, and 11).**

Definition of a Positive Trend for Riparian Vegetation Conditions: Riparian system status includes an assessment of, riparian vegetation conditions, stream form and function and properly functioning condition. Monitoring the Vegetation Resources in Riparian Areas, General Technical Report RMRS-GTR-47 (Winward 2000) or the most currently approved Region 1 protocols for monitoring riparian areas would provide an assessment of trend for riparian systems. Baseline plot data would be collected at permanent plots and measured every three to five years to assess a positive or negative trend. Measurements would include cross sections of vegetation communities in riparian areas, greenline composition and the age-class distribution of woody species.

a. Cross sections of vegetation community types quantify the percent of each community type within the riparian zone. This measurement compared to the baseline indicates the trend or how well an area is managed. A positive trend would be communities moving towards Potential Natural Community (PNC).

b. Greenline composition provides an assessment of the streambank's ability to buffer the hydrological forces of moving water. Disturbances such as overgrazing or trampling caused by human or animal influences can result in a vegetation shift to shallower rooted species. Plant species with shallow roots are less able to buffer the forces of moving water and keep a stream's hydrological features in balance. A positive trend would be an increase in plants that have deep rooting characteristics that enhance bank stability.

c. Woody species age-class distribution and regeneration, where woody species are capable of being present, provides an assessment of whether management is satisfactory to maintain or increase the coverage and density of woody species. A positive trend would be all age classes of shrub and tree species capable of being present in the area are well represented

Definition of a Positive Trend for Stream Form and Function: A positive trend is described as a positive shift in field data generated graphs for Bankfull Width, Residual Pool Depth and Particle Size Distribution between 2007 and whenever the established monitoring reaches are re-measured in three to five years. In the meantime, field data would be collected along other fully functioning stream reaches of similar drainage area, elevation, geology, and stream channel type to make comparisons (figure 2.1).

Definition of a Positive Trend Proper Functioning Condition: A proper functioning condition assessment would be completed every 5th year on long-term monitoring plots (Appendix 1, Map 4) and on an annual basis for those reaches of streams where streambank trampling standards are proposed. A positive trend would be evident if trampling standards and riparian utilization standards are not exceeded and if riparian vegetation conditions are improving (figure 2.1).

3. **By 2018 establish a positive trend of maintaining and restoring native plant communities across the landscape (Monitoring Item 2, 3, 4, 10, 11 Appendix 3).**

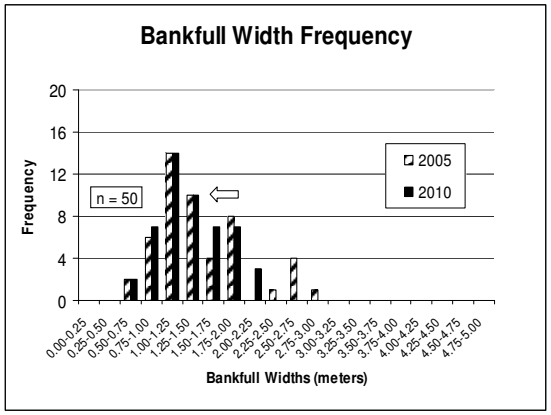
Definition of a positive trend for native plant communities: Definition of a positive trend in #4 below are met along with reductions in non-native grasses, and a trend toward mid to late plant community development.

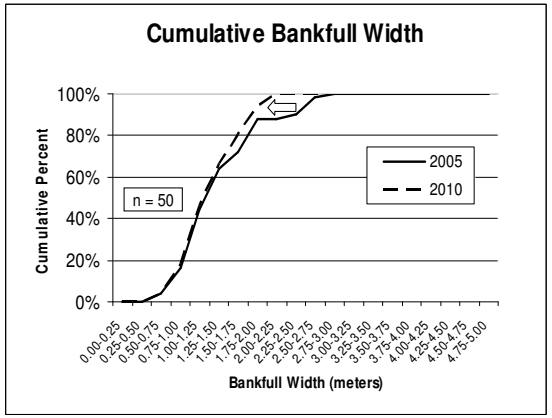
4. **Reduce established weed populations by 50 percent, eliminate infestations of new weed species, and maintain weed-free areas by 2018 (Monitoring Item 3, 4, 9, 10 Appendix 3).**

Definition of a positive trend for reduction of weeds: By 2018: weed inventories are completed on those allotments where there are no inventories; roadsides are 80 percent weed-free; areas of infestations away from roads are either eliminated, kept in check by regular scheduled suppression or are shrinking in size; and, all known infestations are on a regular treatment schedule that at least provides containment.

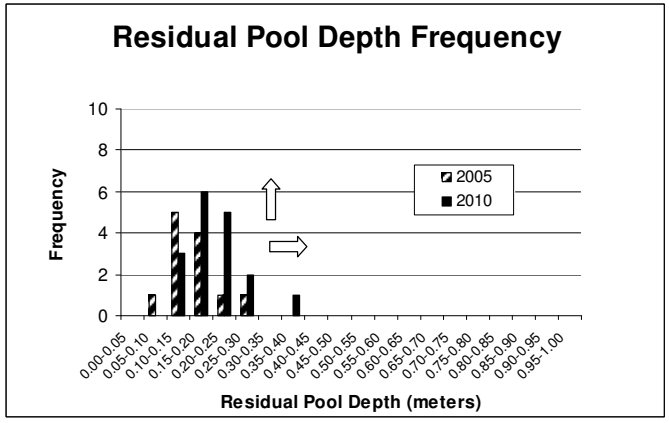
Figure 2.1. Positive Trend in Stream form and Function.

Bankfull Width – In functioning-at-risk and non-functioning stream reaches, bankfull widths increase from streambanks being sheared by livestock. A positive trend would be a leftward shift as displayed in the example frequency and cumulative bankfull width graphs below.

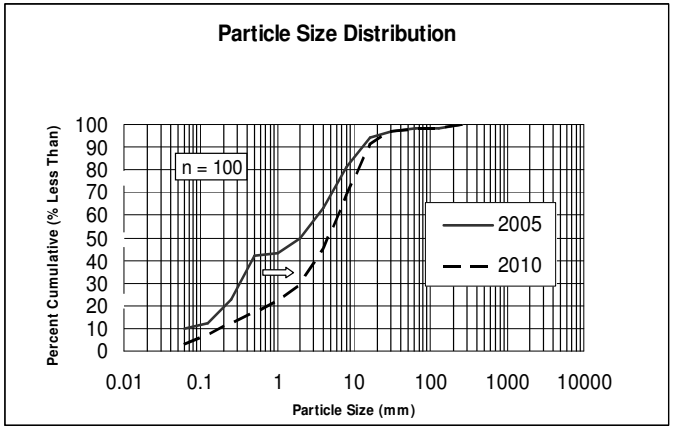




Residual Pool Depth - In functioning-at-risk and non-functioning stream reaches, pools become shallower as stream channels become over-widened and/or filled with fine sediment Residual Pool Depth (max. pool depth minus pool tail crest depth) is a repeatable measurement describing the condition of pools. A positive trend would be a rightward and/or upward shift as displayed in the example frequency graph below.



Particle Size Distribution - In functioning-at-risk and non-functioning stream reaches, Particle Size Distribution can be skewed towards smaller substrate from streambank shear and subsequent erosion. As stream channels begin to stabilize and narrow and become more efficient at transporting fine sediment, a rightward shift in the Particle Size Distribution is expected. A positive trend or rightward shift is displayed in the cumulative particle size graph below.



Monitoring Plan (Appendix 3)
Appendix 3 contains the Monitoring Plan for Alternative 3. Once the objectives were determined the ID Team identified monitoring items. Monitoring is a key to adaptive management it keeps us informed of the District's progress, and provides the District the information needed to make adjustments in management. Numerous potential monitoring items were considered with the following list being those items the ID Team determined would provide us the best information based on their responsiveness to management actions, cost, practically, and also what sort of temporal and spatial scale they represent. For example, do they only reflect a point in time or several years, and do they reflect a condition that is occurring at a very localize scale or something that is happening across the entire landscape. The intent is to pick monitoring items that reflect a variety of spatial and temporal scales Nyberg (1999). Following are those items the ID Team determined could potentially be monitored in Alternative 3.

1. Erosion
2. Upland livestock distribution
3. Compliance with annual operating plan
4. Number of functioning range improvements
5. Trend in Aspen stand structure, function, and composition
6. Trend in Upland Plant community composition
7. Redd trampling
8. Fish and amphibian population structure
9. Stream Channel form and function
10. Streambank disturbance
11. Riparian vegetation health
12. Macro invertebrates
13. Bird community composition
14. Economic Impacts on the permittee

The Monitoring Plan describes the following (Nyberg (1999):

- Items to be monitored at each interval
- Type and Amount of Baseline Data Required
- Type of sample method
- Items Measured or Recorded
- Frequency and Duration of Monitoring
- Timing of monitoring
- Appropriate spatial scales for monitoring different Items
- Who is responsible for undertaking different aspects of monitoring

Out of fourteen items, the ID Team determined items 2, 3, 4, 6, 9, 10, 11 and 14 would be monitored as soon as possible. This determination was based on funding and also usefulness and efficiency of data collection (Johnson 1999). Funding is always a concern when it comes to monitoring. If items are not funded monitoring may not be completed. Items 2, 3, 4, 6, 10, and 14 would be funded by the District's existing annual program of work. These items are either already done or would only take a change in protocol to implement. Item 9 "Stream Channel Form and Function" and Items 11, Riparian Vegetation Health would take additional effort, commitment and

dollars to implement. These long-term monitoring items often take years to detect changes. To accomplish this monitoring, permanent monitoring site are established at several sites on allotments along stream reaches that are vulnerable to livestock grazing (Chapter 3.2).

These sites are located along a cross section of stream reaches ranging from Proper Functioning Condition (PFC) to Non Functioning (NF). None of the riparian vegetation data has been collected yet on these sites. The data collection protocols were just recently finalized for the Region and will be implemented starting in 2009.

Stream channel and fish quality habitat attributes that were measured along these monitoring reaches included bankfull width, bankfull depth, residual pool depth, particle size distribution, stream gradient, and sinuosity. Many of these attributes were also considered when conducting PFC and Stream Channel Stability assessments. These attributes have been shown to be repeatable between observers, can be measured independent of stream flows, and are good indicators of other related stream channel attributes such as pool habitat quality, bank stability, etc. Baseline data from these monitoring sites have been plotted (Project File-Fisheries) as discussed in the Chapter 3.2. These same attributes would be re-measured in three to five years then overlaid on baseline graphs (as above under "Definition of a Positive Trend) to determine if management objectives for stream channel form and function are being achieved.

Item fourteen, "economic impacts on the permittee" would be evaluated during annual meetings with the permittee and includes the commitment to discuss the economic costs to the permittee, and complete calculations of present net value and benefit cost ratios as needed.

The other monitoring items would not be implemented immediately but are available as needed or as funding becomes available. The decision to implement additional monitoring would be made by the District Ranger in consultation with an Adaptive Management Implementation Team.

Adaptive Management Implementation Team (AMIT)
Alternative 3 includes the formation of an interdisciplinary team to oversee the implementation of adaptive management. This is very similar to an existing review process that Forest already has in place called "Best Management Practice Reviews" (BMP). During a Best Management Review an interdisciplinary team evaluates a project or a series of projects and provides feedback related to everything from NEPA compliance to compliance with State and Federal laws and regulations. The AMIT would take the place of the BMP reviews on these allotments.

The functions of the Adaptive Management IDT are:

- Interpretation of complex data when District expertise is not sufficient
- Provide recommendations to the District Ranger regarding which management actions to implement and when they should be implemented
- Provide continuity regarding how monitoring is implemented and interpreted
- Conduct field reviews of specific areas of concern or interest on allotments

Each year the District Ranger and the District Rangeland Management Specialist would decide if there is a need for the team to meet. At a minimum, the team would meet every five years to review implementation and monitoring.

Composition of the AMIT may vary depending upon the issues being reviewed that year but would typically include the following.

- Gallatin National Forest Ecologist/Gallatin Ecosystem Staff representative
- District Rangeland Management Specialist
- District Resource Assistant
- District Wildlife Biologist
- District Fisheries Biologist
- Forest Soils Scientist
- Forest Hydrologist
- District Ranger
- Grazing Permittee representation

In addition, specialists could be assigned as needed (Regional Ecologist, County Extension Agent, Gallatin County Weed District Supervisor; scientists from the Forestry Sciences Lab, and scientists from Montana State University).

Models of Resource Interactions
An important step in adaptive management is building a model of how landscape systems interact. These models can be very simple or complex (Nyberg 1999 and Salafsky, et.al. 2001). The District chose to model how the threats, factors influencing the threats, management actions, objectives and monitoring all interact and relate to the target condition (Nyberg 1999) (Project File IDT notes 2/15/06 – 3/17/06). This helped the ID Team identify what monitoring and management actions would potentially yield the best results. Displays of these relationships are contained in Appendix 4.

Management Actions Scheduled to be Implemented
Implementation of Management Actions specific to each allotment is displayed in table 2.4. Listed in the table are those items that would be implemented immediately and those items that are likely to be implemented next with recommendations of the AMIT. Actual management actions recommended for implementation could change depending upon interpretation of the monitoring data.

Table 2.4. Alternative 3 Implementation of Management Actions. This table displays which Management Actions would be implemented immediately and those most likely to be implemented next. Management Actions are listed in alphabetical order not in order of priority.

Allotment	Threats	Contributing Factors Needing to be Addressed on the Allotment	Implement Management Actions (listed alphabetically)
Canyon Creek	Noxious weed and invasive non-native plant establishment and distribution	Improper livestock distribution Livestock transportation of seed Disturbance of native vegetation	K. Implement upland grazing utilization guidelines**
			P. Change trailing routes*
			Q. Adjust salt and mineral placement*
			R. Noxious weed treatment*
			U. Share permit administration with permittees*
			W. Allow for adequate rest after prescribed or wildfire
			DD. Construct water developments/water gaps*
			EE. Administer grazing permit to standard*

Allotment	Threats	Contributing Factors Needing to be Addressed on the Allotment	Implement Management Actions (listed alphabetically)
Stone Creek	Noxious weed and invasive non-native plant establishment and livestock distribution	Improper livestock distribution Livestock transportation of seed Disturbance of native vegetation	R. Noxious weed treatment*
			W. Allow for adequate rest after prescribed or wildfire*
			DD. Construct water developments/water gaps*
			EE. Administer grazing permit to standard*
			GG. Remove unneeded improvements*
Bangtail Creek	Reduced Riparian Vegetative Health Reduced Stream Form and Function Noxious weed and invasive non-native plant establishment and livestock distribution	Improper livestock distribution Livestock transportation of seed Disturbance of native vegetation Streambank trampling Recreation	B. Implement prescribed fires**
			C. Change razing systems
			D. Decommission roads*
			E. Road maintenance*
			F. Create or reconfigure pastures*
			H. Combine some or all allotments*
			I. Change livestock numbers
			O. Harden stream crossings**
			Q. Adjust salt and mineral placement*
			R. Noxious weed treatment*
			S. Change grazing season*
			U. Share permit administration with permittees*
			V. Build or rebuild a fence*
			W. Allow for adequate rest after prescribed or wildfire*
			BB. Conduct bank stabilization*
			CC. Implement updated riparian grazing guidelines*
			EE. Administer grazing permit to standard*
			FF. Mechanical treatment *
			GG. Remove unneeded improvements*
Willow Creek	Reduced Riparian Vegetative Health Reduced Stream Form and Function Noxious weed and invasive non-native plant establishment and livestock distribution	Improper livestock distribution Livestock transportation of seed Disturbance of native vegetation Drop in water tables Streambank trampling Streams not in PFC	B. Implement prescribed fires**
			F. Create or reconfigure pastures**
			O. Harden stream crossings**
			Q. Adjust salt and mineral placement*
			R. Noxious weed treatment*
			A. Construct exclosures*
			C. Change grazing systems*
			H. Combine some or all allotments*
			I. Change livestock numbers*
			J. Instream improvements*
			M. Control tall larkspur*
			P. Change trailing routes*
			S. Change grazing season**
			U. Share permit administration with permittees*
			V. Build or rebuild a fence*
			W. Allow for adequate rest after prescribed or wildfire**
			BB. Conduct bank stabilization*
			CC. Implement updated riparian grazing guidelines*
			DD. Construct water developments/water gaps*
			EE. Administer grazing permit to standard*
			FF. Mechanical treatment*
			II. Adjust permit for on-off use*

Allotment	Threats	Contributing Factors Needing to be Addressed on the Allotment	Implement Management Actions (listed alphabetically)
Jackson Creek	Reduced Riparian Vegetative Health Reduced Stream Form and Function Noxious weed and invasive non-native plant establishment and livestock distribution	Livestock transportation of seed Disturbance of native vegetation	A. Construct exclosures**
			C. Change grazing systems**
			E. Road maintenance*
			J. Instream improvements**
			K. Implement updated upland grazing utilization standards*
			R. Noxious weed treatment*
			P. Change trailing routes*
			Q. Adjust salt and mineral placement*
			V. Build or rebuild a fence*
			U. Share permit administration with permittees*
			W. Allow for adequate rest after prescribed or wildfire*
			X. Make use of or create grass banks*
			BB. Conduct bank stabilization projects*
			CC. Implement updated riparian grazing guidelines*
			DD. Construct water developments/water gaps*
			EE. Administer grazing permit to standard*
			FF. Mechanical treatment*
			GG. Remove unneeded improvements*

*Implement immediately.
**Implementation likely to happen next based on recommendation by the AMIT.

2.10 Mitigation and Project Design Features Common to all Alternatives

The following mitigation would be implemented for Alternatives 1, 2, and 3.

Noxious Weeds
Forest Service Manual 2081.2 includes the following requirements and recommended control and prevention measures.

Required:
(1) Ensure weed prevention and control are considered in management of all grazing allotments.
(a) Include weed risk assessment in environmental analysis for rangeland projects.
(b) When other plans do not already address noxious weeds, include practices and control measures in Annual Operating Plans.

(2) Minimize ground disturbance and bare soil.
(a) Revegetate, where applicable, bare soil from grazing activities according to the following:

Revegetate all disturbed soil, except the travel way on surfaced roads, in a manner that optimizes plant establishment for that specific site, unless ongoing disturbance at the site would prevent weed establishment. Use native material where appropriate and available. Use a seed mix that includes fast, early season species to provide quick, dense revegetation. To avoid weed contaminated seed, each lot must be tested by a certified seed laboratory against the all State noxious weed lists and documentation of the seed inspection test provided.

Use local seeding guidelines for detailed procedures and appropriate mixes. Use native material where appropriate and available. Revegetation may include planting, seeding, fertilization, and weed-free mulching as indicated by local prescriptions.

Monitor and evaluate success of revegetation in relation to project plan. Repeat as indicated by local prescriptions.

(b) Check areas of concentrated livestock use for weed establishment and treat new infestations.

(3) Minimize transport of weed seed into and within allotments.
(a) Remove all mud, dirt, and plant parts from all off road equipment before moving into project area. Cleaning must occur off National Forest lands. (This does not apply to service vehicles that stay on the roadway, traveling frequently in and out of the project area.)
(b) Clean all equipment prior to leaving the project site, if operating in areas infested with new invaders (as determined by the Forest Weed Specialist).
(c) Straw used for road stabilization and erosion control would be certified weed-free or weed-seed-free.

Recommended:
(1) Transport of weed seed into and within allotments should be minimized.
(a) Avoid driving vehicles through off-road weed infestations.
(b) Feed certified weed-free feed to livestock for several days prior to moving them onto the allotment to reduce the introduction of new invaders and spread of existing weed species. Consider using transitional pastures when moving animals from weed infested areas to the National Forest. (Transitional pastures are designated fenced areas that can be logistically and economically maintained.)
(c) Consider excluding livestock from sites with new invaders or treat new invaders in these areas before entry by livestock.
(2) Maintain healthy desirable vegetation that is resistant to noxious weed establishment.
(a) Consider managing forage utilization to maintain the vigor of desirable plant species as described in the Allotment Management Plan.
(b) Minimize or exclude grazing on restoration areas until vegetation is well established.

(Responsible Official: District Resource Assistant)

Heritage Resources
A heritage resource survey would be conducted prior to any ground disturbing activities such as construction of fences, water developments, etc. (Responsible Official: Forest Archeologist)

Sensitive Plants
A sensitive plant survey would be conducted prior to the construction of allotment improvements for such things as fences and water developments. In the event that a sensitive species is found appropriate mitigation would be implemented to ensure no damage to the plant's habitat occurs. This could include construction of a fence, moving the location of the project or dropping the project altogether. (Responsible Official: District Rangeland Management Specialist).

2.11 Comparison of Alternatives

Table 2.5. Comparison of Alternatives. This table summarizes and compares the environmental effects of each alternative.

Issue	Indicators	Alternative 1	Alternative 2	Alternative 3
Issue: Affects on stream channel form and function	Recovery of Bankfull width, particle size distribution and residual pool depth, and Proper Functioning Condition Stream Channel Stability	81 %	29%	81%
	Estimated Rate of Recovery	Fastest	Slowest	Intermediate
Issue: Affects on terrestrial plant life including; the composition and successional development of plant communities; and, the presence of invasive nonnative species.	Riparian plant communities affected by all activities	246 ac	431 ac	431 ac
	Upland plant communities affected by grazing	0	5,251 ac	5,251 ac
	Acres at very high risk to the noxious weed houndstongue*	6 ac	1,811 ac	1,811 ac
Issue: Livestock grazing could affect terrestrial and aquatic animal life including threatened, endangered, sensitive, management indicator, and other species.	**Threatened or Endangered Species**			
	Lynx	No Effect	No Effect	No Effect
	Sensitive Species			
	Yellowstone Cutthroat Trout (also MIS)	Slight increase in some populations	No decrease in populations	Possibly slight increase in some populations
	Grizzly Bear, Gray Wolf, Bald Eagle, Wolverine, Trumpeter Swan, Black-backed, Peregrine Falcon Wood Pecker, and Harlequin Duck	No Impact	No Impact	No Impact
	Big-eared bat	No Impact	MIIH**	No Impact
	Flammulated Owl	No Impact	MIIH	No Impact
	Goshawks	No Impact	MIIH	No Impact
	Management Indicator Species (MIS)			
	Pine marten	No Effect	No Effect	No Effect
	Elk	Slight Improvement in Habitat	No Improvement in Habitat	Slight Improvement in Habitat
	Other Species			
	Migratory Birds	Notable Improvement in Habitat	No Improvement in habitat	Slight Improvement in Habitat
Issue: Economics	Present Net Value***	-$30,054	-$12,093	-$20,536
	Benefit/Cost Ratio***	0	0.56	0.42
	Affects on Operators	Large impacts on individual permittees and ranch operations	No affect maintains ranch operation	Costs to permittee but maintains ranch operation

*Houndstongue is used as the species to compare alternatives in this table because it is seen as the species with the highest potential for transportation by livestock.
**May Impact Individuals or their Habitat but would not lead in a trend toward federal listing.

CHAPTER 3.0 AFFECTED ENVIRONMENT

3.1 Contents of Chapter

This Chapter describes the general environment of the area affected by the proposal. It pays special attention to those resources that have been determined from public comment and internal reviews to be the most relevant issues to this analysis. The description of each resource also includes an estimate of the geographic extent of the anticipated environmental effects described in Chapter 4.

Literature reviews and data collection was conducted by specialists on the ID Team. This provided the ID Team recent, relevant, site-specific data and scientific information. In a very few cases, older data was used or a mix of data sources were used in the assessments. The ID Team reviewed numerous current publications to become familiar with specific topics related to livestock grazing and associated effects in the Bangtail Mountains and the surrounding area.

3.2 Stream Form and Function and Aquatic Animal Life

General Watershed Conditions

Precipitation and Water Yield: The Bangtail grazing allotments are located mostly on the eastern slope of the Bangtail Mountains within the Shields River, and Gallatin River sub-basins (table 3.1). Average annual precipitation varies from about 25 inches near the lower elevation at the Forest Boundary to about 35 inches along the ridge tips. The percent of the average annual precipitation which falls as snow varies from 40 to 50 percent. Rainfall intensity is moderate. The 2 year-6 hour rainfall varies from 0.9 to 1.0 inches while the 10 year-24 hour rainfall varies from 2.2 to 2.5 inches (Miller et.al.,1973). These precipitation intensities are higher than the Gallatin and Madison Ranges but are lower than the eastern part of the Crazy and Beartooth which can be affected by eastern "upslope" storm masses. The Bangtails are protected from the most intensive upslope conditions by the Crazy Mountains. Water yield varies from about 0.7 acre feet/acre at 6,000 feet to about 0.9 acre feet/acre at 7,600 feet. This represents an average of about 30 percent precipitation to runoff efficiency.

Hydrologic Unit Codes and Analysis Area: The five Bangtail allotments fall within two 4th field Hydrologic Unit Codes (HUC), five 5th Field HUC's and eight 6th field HUC's (table 3.2). The following aquatics and watershed information is organized by 6th Field HUC sub-watersheds. Two of the eight 6th field HUCs are not discussed within here for the following reasons relating to size of area, topography and proximity to perennial streams (denoted by asterisks in table 3.2). The National Forest portion of the Billman sub-watershed (193 acres) is primarily steep forested headwaters located considerable distance from live water and rarely used by livestock. Grazing on the National Forest within the Upper Bridger Creek sub-watershed (1,353 acres) primarily occurs on the flatter drier slopes along the crest of the Bangtail Mountains. With the exception of a couple headwater springs and ephemeral/intermittent stream channels, the majority of the grazing occurs away from live water.

Table 3.1. List of 4th, 5th and 6th Field Hydrologic Units Codes (HUC) and acreages for 6th order HUCs both on and off the Gallatin National Forest. Asterisk denotes sub-watersheds that will not be analyzed within the Bangtail Allotment Environmental Assessment.

4th Field HUC (Sub-Basin)	5th Field HUC (Watershed)	6th Field HUC (Sub-watershed)	Total 6th Field HUC (Acres)	Allotment Area (acres)		Analysis Area (acres)	
				Private	National Forest	Private	National Forest
Shields River	Middle Shields River	Upper Brackett Creek	27,613	0/[a]	3,043	2,547	2,266
	Lower Shields River	Canyon Creek	14,004	0/[a]	2,080	1,770	1,965
		Bangtail Creek	8,613	527	2,437	1,292	2,437
		Willow Creek	19,557	0	3,793	352	3,793
	Yellowstone River-Livingston	Fleshman Creek	15,285	0	994	0	994
		Billman Creek*	33,991	0	193	Not Being Analyzed	Not Being Analyzed
Gallatin River	Upper East Gallatin River	Jackson Creek	12,236	2,301	2,870	2,313	2,870
	Bridger Creek	Upper Bridger Creek*	30,566	0/[a]	1,353	Not Being Analyzed	Not Being Analyzed

/[a] Several parcels of unfenced private land lie adjacent to or within these three allotments. Private land owners are required to fence their property to keep cows out. Until these landowners fence their parcels or lease their land to the permittees, livestock permitted on the National Forest would continue to graze these parcels.

Past timber harvesting has occurred thoughout all of the six analysis area sub-watersheds. Most recently, timber harvesting ocurred in the late-1990's by Big Sky Lumber (BSL) prior to those lands being exchanged to the Gallatin National Forest.

Soil parent material within the Bangtail allotments is mapped as entirely Livingston volcanics (Ramsey and Davis, 1978). The allotments include some soils that are medium to coarse textured, moderately well drained, low to moderate soil erodibility, moderate delivery efficiency, and low range productivity. The stream bottoms of several of the allotments (floodplain and terraces) are formed on alluvial deposits. These areas have soils that are moderately coarse textured with high water holding capacity with low surface runoff potential, moderate soil erodibility, high sediment delivery efficiency, and low to moderate range productivity (Davis and Shovic 1996).

Table 3.2. List of perennial streams within the five watersheds and eight sub-watersheds within the Bangtail Allotments. Two of the sub-watersheds (denoted by an *) will not be described for reasons listed above.

5th Field HUC (Watershed)	6th Field HUC (Sub-watershed)	Livestock Allotment (s) within each 6th Field HUC /a	Perennial Streams within Allotments
Middle Shields River	Upper Brackett Creek	Canyon Creek	Weasel Creek Skunk Creek Miles Creek
Lower Shields River	Canyon Creek	Canyon Creek	Canyon Creek Grouse Creek Bridgeman Creek
	Bangtail Creek	Bangtail Creek Canyon Creek Stone Creek	Bangtail Creek
	Willow Creek	Willow Creek Stone Creek	N. Fk. Willow Creek M. Fk. Willow Creek S. Fk. Willow Creek
Yellowstone River - Livingston	Fleshman Creek	Jackson Creek	Fleshman Creek
	Billman Creek*	Jackson Creek	
Upper East Gallatin River	Jackson Creek	Jackson Creek	Jackson Creek
Bridger Creek	Upper Bridger Creek*	Stone Creek Jackson Creek	Very headwaters of several tributaries

*Not analyzed

Compliance with Water Quality Laws and Regulations: Very limited water quality data is available for the Bangtails. Total sediment yields have been measured in Stone Creek at 42.1 and 39.5 tons/mi2/year which was used to approximate a baseline sediment yield of 40 tons/mi2/year used in the sediment modeling.

Steam composition is generally gravel/cobble/small boulder with some lower gradient, finer textured depositional sections on the larger streams near the Forest boundary (Stone and Jackson Creeks). Sections of lower gradient Bangtail streams are affected by livestock grazing particularly in lower Bangtail Creek, lower North Fork and Middle Fork of Willow Creek, and parts of Jackson Creek.

Much of the Bangtail Mountains were roaded and logged in the 1980's and up to the mid-1990's before completion of a recent land exchange. Since 1999 very little commercial timber harvesting has occurred on National Forest lands on the east side of the range. An evaluation of aerial photos, Gallatin National Forest timber sale records, and harvesting information for private lands indicates that timber harvest included about 200 acres in Bangtail Creek by 1980 and an additional 245 acres by 1988. Willow Creek timber harvest included about 300 acres by 1980, an additional 677 acres

by 1988, and 278 acres by 1998. Jackson Creek timber harvest included about 1,050 acres by 1980, an additional 600 acres by 1988, and 598 acres by 1998.

Sediment yield from roads varies widely. Erosion and sediment in the roads is increased by compacted surfaces, decreased infiltration, increased in surface runoff during storm events, and surface erosion of the road prism and land areas below road drainage outlets. Several of the primary access roads are sediment sources which could be reduced with additional drainage. Most of the acquired private land roads are not open to public motorized travel and are in various states of vegetative recovery. Many of the road segments have revegetated since completion of timber harvesting in the 1980's and 1900's. In 2006, 2007, and 2008 approximately 63 miles of excess roads and unauthorized user made ATV routes were decommissioned by recontouring or ripping, seeding, culvert removal, and placement of slash.

Wetlands are lands in transition between terrestrial and aquatic systems where the water table is at or near the surface of the land and often covered by shallow water. To be considered jurisdictional wetlands, wetlands must be saturated at least part of the year, have un-drained hydric soils and support predominantly hydrophytic vegetation. Wetlands are extremely valuable wildlife, esthetic, and recreation habitats, and have important functions such as sediment filtration, flow moderation, nutrient and other pollutant attenuation, and act as sources of organic energy for adjacent aquatic habitats. The Bangtail allotments are generally heavily dissected and well drained, with limited areas of wetlands. The most frequent type of wetland on the allotments is riverine wetland along perennial stream channels and springs. A few palustrine wetlands occur in wet meadows and forested wet areas.

The State of Montana Water Quality Act requires the state to protect, maintain, and improve the quality of water for a variety of beneficial uses. Section 75-5-101, MCA established water quality standards based on beneficial uses. The Montana Department of Environmental Quality has designated all non-wilderness surface waters in the project area as B1 Classification. Waters classified as B1 must be suitable for: drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming and recreation: growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and, agricultural and industrial water supply. All surface waters within the Bangtail Range classified as B1. No known water quality violations of Montana B-1 numerical standards (which apply to the entire area) occur.

In contrast to State, the Gallatin Forest Plan implementation guidelines identify streams as either Category A or B. Category A streams contains sensitive species and/or Blue Ribbon fisheries. All other streams are classified as Category B. Bangtail and Willow Creeks are Category A streams since they contain Yellowstone cutthroat trout (YCT) populations. Perkins Creek is also a Category A stream since it is tributary to Fleshman Creek which has YCT. Jackson Creek is not a cutthroat fishery and is a Category B stream.

In addition to the State classifications and the Gallatin Forest Plan categories, the Clean Water Act (1972) has stream designations that identify water quality limited segments of streams (303(d) list). Two stream segments on the Montana DEQ 303(d) list occur in the analysis area on Jackson and Stone Creeks. An approximately 3 mile section of Jackson Creek from the headwaters to the Forest Boundary is part of the 7 mile listed segment for Jackson Creek (http://cwaic.mt.gov/Default.aspx). This section is listed as partially supporting aquatic life, cold

water fishery and primary contact recreation. Probable causes include vegetation alteration, sedimentation, chlorophyll a, and total phosphorous from grazing in riparian zones and crop production. Surveys conducted on the National Forest section of Jackson Creek in 2008 indicated no discernable impact from cattle grazing and no change in channel stability (Project File – Hydrology). Jackson Creek is included in the currently ongoing Lower Gallatin Total Daily Maximum Load (TMDL) Plan which is tentatively planned for completion in 2009 or 2010.

About 500 feet of an ephemeral tributary to the upper end of Stone Creek in the Stone Creek Allotment is listed as only partially supporting aquatic life and cold water fishery. Probable causes include vegetation alteration and sedimentation from grazing in riparian areas or logging. However, this ephemeral segment is not grazed and has not been logged. Stone Creek is tributary to the main stem of Bridger Creek which is listed from the headwaters to the confluence with the East Gallatin River as only partially supporting aquatic life, cold water fishery and primary contact recreation. Probable causes include chlorophyll a, phosphorus, and total nitrogen from riparian grazing, resort areas winter and non-winter, and unpaved roads or trails.

There are other streams downstream of the allotments on the 303d list. A 12.1 mile section of Billman Creek that flows south of the Bangtails range is listed as only partially supporting aquatic life and cold water fishery. Probable causes include nitrite and sedimentation from agriculture and channelization (considerably downstream from the Bangtails) vegetation alteration, sedimentation, chlorophyll a, and total phosphorous from grazing in riparian zones and crop production. A 20.3 mile segment of the Shields River, from the confluence with Cottonwood Creek to the Yellowstone River, is listed as partially supporting aquatic life, cold water fishery and primary contact recreation. Probable causes include bank erosion, dewatering, flow alteration, riparian degradation, and siltation from agriculture, grazing, hydro-modification, and flow regulation/modification. These causes are due primarily to agriculture activities along the Shields River. Bangtail and Willow Creeks are tributary to the listed Shields River segment about 12 miles downstream. The Shields River TMDL plan was developed by the Montana DEQ in 2008 which prescribed sediment reduction practices for private land agriculture and road decommissioning on National Forest lands in the Bangtails (completed), and improved road and trail drainage, and road surfacing in the Crazy Mountains (upper Shields River).

Livestock grazing impacts to water quality can include increased stream temperature through removal of riparian vegetation, increased stream sedimentation from bank trampling, and elevated bacteria numbers derived from livestock urine and feces. Water quality is included in the watershed analysis but not as a separate issue based on the determination that the Bangtails allotments areas are in compliance with Montana water quality laws and regulations (Chapter 2.3).

Water quality can be defined as the biological, chemical, and physical conditions of a waterbody. It is a measure of a waterbodies ability to support beneficial uses. Therefore, if a stream supports beneficial uses then it meets water quality standards even though there may be some reduced water quality.

To be in compliance with Montana water quality law and regulations land management activities must include the following three elements:

1. Best Management Practices (BMP's) are being applied;

The Administrative Rules of Montana (ARM 16.20.603) identifies that "land management activities must not generate pollutants in excess of those that are naturally occurring", regardless of the stream's classification. "Naturally occurring" is defined in the ARM as "the water quality condition resulting from runoff or percolation over which man has no control or from developed lands where all reasonable land, soil, and water conservation practices (Best Management Practices) have been applied". The Soil and Water Conservation Handbook (FSH 2509.22; 5/88 & 4/95) list some of the BMP's used on the allotments to protect beneficial uses.

2. Beneficial uses are not impaired;

Administrative Rules of Montana (ARM 16.20.604) classify all waters within the eleven allotments as B-1 suitable for multiple uses including domestic water supply after conventional treatment. The B-1 classification includes cold water fisheries, commonly mountain or foothill streams that support trout and associated fish. Water quality standard violations by livestock grazing in Montana are usually associated with feedlots or corrals where livestock are heavily concentrated near streams. These situations do not occur on these allotments. Although some streams are too cold to support a fishery, all others are able to support cold-water fisheries.

3. Monitoring is in place to test whether BMP's are adequate to protect beneficial uses.

Since 1989, the Gallatin National Forest has had an allotment BMP monitoring program as part of implementation water quality monitoring. This monitoring program indicates implementation of BMP's on the Gallatin National Forest is protecting beneficial uses.

All allotment activities are in compliance with the three elements described above. Therefore, the issue of water quality was dismissed (Chapter 2.3).

Sediment Yield Modeling: Existing sediment yields for the main Bangtail allotment streams were estimated using the R1/R4 sediment model (Cline et. al. 1981) and adjusting sediment coefficients based on existing road and timber harvest conditions (table 3.3). Sediment modeling results are shown in table 3.4. The sediment model was run in a cumulative fashion accounting for all existing roads, timber harvesting, and residential, and recreational developments for all land ownerships. The model does not attempt to analyze the effects of grazing and mining activities (other than vegetation removal and road construction) or individual episodic storm events. The model is designed to compare relative differences among alternatives rather than to predict precise sediment and water yields that are likely to occur upon project implementation. Because the R1/R4 model relies on climatic conditions averaged over long periods, the models' accuracy is best when averaged over several years. The model is less reflective of individual drought or flood years. The R1/R4 sediment model focuses on slope processes and estimates the water and sediment delivered to the main channel by forest management within the watershed, including the headwater stream channels. However, the routing of sediment and water through the main channel is limited to broadly-based regional curves as no main channel hydrologic or hydraulic processes are modeled directly.

Table 3.3. Sediment Attributes. List of attributes used during sediment modeling and as well as indicators to be used to compare between alternatives in Chapter 4.2.

6th Field HUC (Sub-watershed) /[a]	Indicators	Past (1950–2009)	Present (Approved Activities)
Upper Bracket Creek	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#)/[b]	0	0
	Primary Rangeland Grazed (acres) /[c]	1,347	0
	Timber Harvest (acres)	2,108	0
	Roads (miles)	17.5	0
	Road Stream Crossings (#)	19	0
	Roads in Stream Influence Zones (SIZ) (miles)	2.4	0
Canyon Creek	Sites Not in PFC or > 20 Point SCS Departure (#)	0	0
	Primary Rangeland Grazed (acres)	1,310	0
	Timber Harvest (acres)	1,668	0
	Roads (miles)	19.2	0
	Road Stream Crossings (#)	16	0
	Roads in SIZ (miles)	1.0	0
Bangtail Creek	Sites Not in PFC or > 20 Point SCS Departure (#)	3	0
	Primary Rangeland Grazed (acres)	2,211	0
	Timber Harvest (acres)	596	0
	Roads (miles)	12.1	0
	Road Stream Crossings (#)	9	0
	Roads in SIZ (miles)	0.6	0
Willow Creek	Sites Not in PFC or > 20 Point SCS Departure (#)	8	0
	Primary Rangeland Grazed (acres)	1,450	0
	Timber Harvest (acres)	1,267	0
	Roads (miles)	16.5	0
	Road Stream Crossings (#)	10	0
	Roads in SIZ (miles)	1.1	0
Fleshman Creek	Areas Not in PFC or > 20 Point SCS Departure (#)	2	0
	Primary Rangeland Grazed (acres)	510	0
	Timber Harvest (acres)	386	0
	Roads (miles)	2.9	0
	Road Stream Crossings (#)	2	0
	Roads in SIZ (miles)	0.1	0
Jackson Creek	Areas Not in PFC or > 20 Point SCS Departure (#)	0	0
	Primary Rangeland Grazed (acres)	912	0
	Timber Harvest (acres)	2,819	0
	Roads (miles)	31.4	0
	Road Stream Crossings (#)	27	0
	Roads in SIZ (miles)	3.5	0

/[a] = only those six major sub-watersheds displayed in table 3.3 will be analyzed.
/[b] = only those areas thought to be degraded partially or entirely by livestock grazing.
/[c] = sub-watershed may contain more than one grazing allotment. Livestock grazing also occurs on private land outside allotment boundaries, but is not included in this table.

Table 3.4. Sediment Yield. Sediment modeling of 6th Field HUC's (sub-watersheds) in the Bangtail allotments. Sub-watershed and analysis area acres are listed in table 3.1.

6th Field HUC (Sub-watershed)	Analysis Area (acres)	Roads (miles)	Timber Harvest		Sediment Delivery (Percent Over Natural)
			Total (acres)	< 6 Years (acres)	
Upper Brackett Creek	4,813	17.5	2,108	0	18
Canyon Creek	3,735	19.2	1,668	0	13
Bangtail Creek	3,729	12.1	596	0	23
Willow Creek	4,145	16.5	1,267	0	21
Fleshman Creek	994	2.9	386	0	18
Jackson Creek	5,183	31.4	2,819	0	25

The sediment modeling indicates that roads are the primary human caused sediment source in the Bangtail Allotments with very limited additional sediment from timber harvest areas which have largely recovered. Skunk Creek, Miles Creek, Canyon Creek, Bangtail Creek, Willow Creek, Fleshman Creek are Category A streams per the Gallatin National Forest sediment guidelines. Jackson Creek is a Category B stream. All of the streams are currently in compliance with sediment standards within the Gallatin National Forest boundary and at the 6th Field HUC (sub-watershed) boundaries. Compliance with Gallatin National Forest sediment standards has been facilitatied by 2006 – 2008 road decommissioning work.

Existing estimated average annual water yield increase above baseline averages about 3.5 percent for the Bangtails area. The primary variable in water yield is re-forestation of harvested units which reduces water yield. None of the water yield changes are sufficient to be measurable with conventional stream gaging equipment.

Proper Functioning Condition and Channel Stability: During the field season of 2008, 24 sites were visited to conduct Proper Function Condition (BLM 1998), Stream Channel Stability (Pfankuch 1975) and/or Rosgen Stream Channel (Rosgen 1996) assessments. Results of these 24 site visits are displayed in table 3.5.

Stream Channel types are primarily A2, A3, B2, and B3 (Rosgen 1996) with fair to good streambank stability (Pfankuch, 1975, Stream Reach Inventory and Channel Stability Evaluation, USFS, R1). Steam composition is generally gravel/cobble/small boulder with some lower gradient, finer textured depositional sections on the larger streams near the Forest Boundary (Stone and Jackson Creeks).

Eleven of 24 sites (or 46 percent) where a Proper Function Condition assessment (BLM 1998) was completed were determined to be in proper functioning condition (table 3.5). Twelve of these 24 sites (or 50 percent) were determined to be in functioning-at-risk condition (five with no apparent trend or static, two were in a downward trend and five were in an upward trend). One of these 24 sites (or 4 percent) was in non-functioning condition with a downward trend. Four of the 13 sites (or stream segments) that were assessed to be functioning-at-risk or non-functioning also had a 20-point departure in the Stream Channel Stability (SCS) rating. These four sites were thought to be entirely or partially related to livestock grazing (table 3.6).

Table 3.5. Summary of Properly Functioning Condition (PFC), Stream Channel Stability and Rosgen Stream Channel Classification for 24 sites across five Bangtail allotments.

Stream	Allotment	Location TRS	Stream Channel Type	Stream Channel Stability			PFC Rating	Map Ref. #
				Reference	Existing	Departure		
Upper Brackett Creek Sub-watershed								
Mile Cr	Canyon	T1N R7E S23 SE1/4	B4a	61	68	7	PFC ↔	25
Unnamed Trib., Mile Cr	Canyon	T1N R7E S23 NE1/4	NO DATA	50	57	7	PFC ↔	24
Canyon Creek Sub-watershed								
Canyon Creek	Canyon	T1N R7E S25 SW1/4	NO DATA	61	65	4	PFC ↔	15
Canyon Creek	Canyon	T1N R7E S25 NE1/4	NO DATA	68	68	0	PFC ↔	16
Canyon Creek	Canyon	T1N R7E S30 NW1/4	NO DATA	71	74	3	PFC ↔	18
Unnamed Trib., Canyon Creek	Canyon	T1N R7E S30 SW1/4	NO DATA	45	45	0	PFC ↔	17
Bangtail Creek Sub-watershed								
Bangtail Creek	Bangtail	T1S R8E S05 NE1/4	NO DATA	90	94	4	PFC ↑	19
Bangtail Creek	Bangtail	T1S R8E S32 SE1/4	NO DATA	98	124	26	FAR ↓	20*
Bangtail Creek	Bangtail	T1N R8E S32 SE1/4	NO DATA	68	80	12	FAR ↓	21
Bangtail Creek	Bangtail	T1N R8E S32 NE1/4	B4	58	71	13	PFC ↔	22
Bangtail Creek	Bangtail	T1N R8E S33 NE1/4	F4	80	101	21	FAR ↔	23*
Willow Creek Sub-watershed								
N. Fk. Willow Creek	Willow	T1S R8E S17 NE1/4	E4	80	105	25	FAR ↑	1
N. Fk. Willow Creek	Willow	T1S R8E S09 SW1/4	NO DATA				FAR ↑	2
N. Fk. Willow Creek	Willow	T1S R8E S09 SW1/4	NO DATA	72	85	13	FAR ↑	3
N. Fk. Willow Creek	Willow	T1S R8E S09 SW1/4	NO DATA	78	90	12	FAR ↑	5*
N. Fk. Willow Creek	Willow	T1S R8E S09 SE1/4	NO DATA	64	71	7	PFC	6
N. Fk. Willow Creek	Willow	T1S R8E S09 NE1/4	NO DATA	65	77	12	FAR ↔	7
N. Fk. Willow Creek	Willow	T1S R8E S09 NE1/4	NO DATA	63	67	4	PFC ↑	8
M. Fk. Willow Creek	Willow	T1S R8E S15 NW1/4	NO DATA	74	82	8	FAR ↑	9
M. Fk. Willow Creek	Outside Allotment	T1S R8E S10 NW1/4	NO DATA	74	90	16	FAR ↔	10
S. Fk. Willow Creek	Willow	T1S R8E S15 SE1/4	NO DATA	62	76	14	FAR ↔	11
Fleshman Sub-watershed								
Fleshman Creek	Jackson	T1S R8E S22 SW1/4	NO DATA	79	105	26	NF ↓	12
Fleshman Creek	Jackson	T1S R8E S22 SW1/4	NO DATA	65	78	13	FAR ↔	13
Billman Creek Sub-watershed (No Sites)								
Jackson Creek Sub-watershed								
Jackson Creek	Jackson	T1S R8E S29 NE1/4	NO DATA	69	69	0	PFC ↔	14
Upper Bridger Creek Sub-watershed (No Sites)								

Apparent Trend
↔ = No
↓ = Downward
↑ = Upward
* = Long-term Monitoring Sites (3).

Table 3.6. Relationship that livestock grazing plays on 13 stream segments that are functioning-at-risk, non-functioning or that have more than a 20-point departure in the Stream Channel Stability.

Functioning Status	Apparent Trend	Number of Sites	Relationship of Livestock Grazing to Degraded Sites		
			Entirely Related	Partially Related	Not Related
Functioning-At-Risk	Upward (↑)	5	1	4	0
	Downward (↓)	2	0	2	0
	Static (↔)	5	4	1	0
Non-Functioning	Upward (↑)	0	0	0	0
	Downward (↓)	1	1	0	0
	Static (↔)	0	0	0	0
TOTAL		13	6	7	0

Long-term Stream Monitoring: Three stream channel monitoring reaches were selected and read for the first time in 2008 to monitor the effectiveness of the proposed grazing standards and to gather baseline information. The Draft Range Allotment Stream Channel Monitoring Protocol (reference, October 7, 2005) can be found in the project file. Low gradient stream reaches with limited rock content were selected. These are stream channel types that are susceptible to livestock related impacts. Table 3.7 displays the legal location to the nearest quarter section of each of the three monitoring reaches.

Table 3.7. Legal location of three selected stream channel monitoring reaches installed in 2008 by allotment.

Allotment	Stream	Legal
Canyon Creek	No monitoring sties selected	
Bangtail Creek	Upper Bangtail Creek	T1S, R8E, Section 5 NE 1/4
	Lower Bangtail Creek	T1N, R8E, Section 33 NE 1/4
Willow Creek	North Fork Willow Creek	T1S, R8E, Section SW 1/4
Jackson Creek	No monitoring sites selected	
Stone Creek	No monitoring sites selected	

Figure 3.1 displays monitoring data for lower Bangtail Creek, one of the three monitoring sites listed in table 3.7. These graphs are also available in the project file for the remaining two monitoring sites. Brief summarizations of these graphs are included in each of the specific sub-watershed descriptions below. These sites would be revisited every three to five years. Trend would be determined be overlaying data from different years on the same graph similar to what is displayed in figure 2.1 in Chapter 2. Appendix 1 Map 4 displays the monitoring site locations.

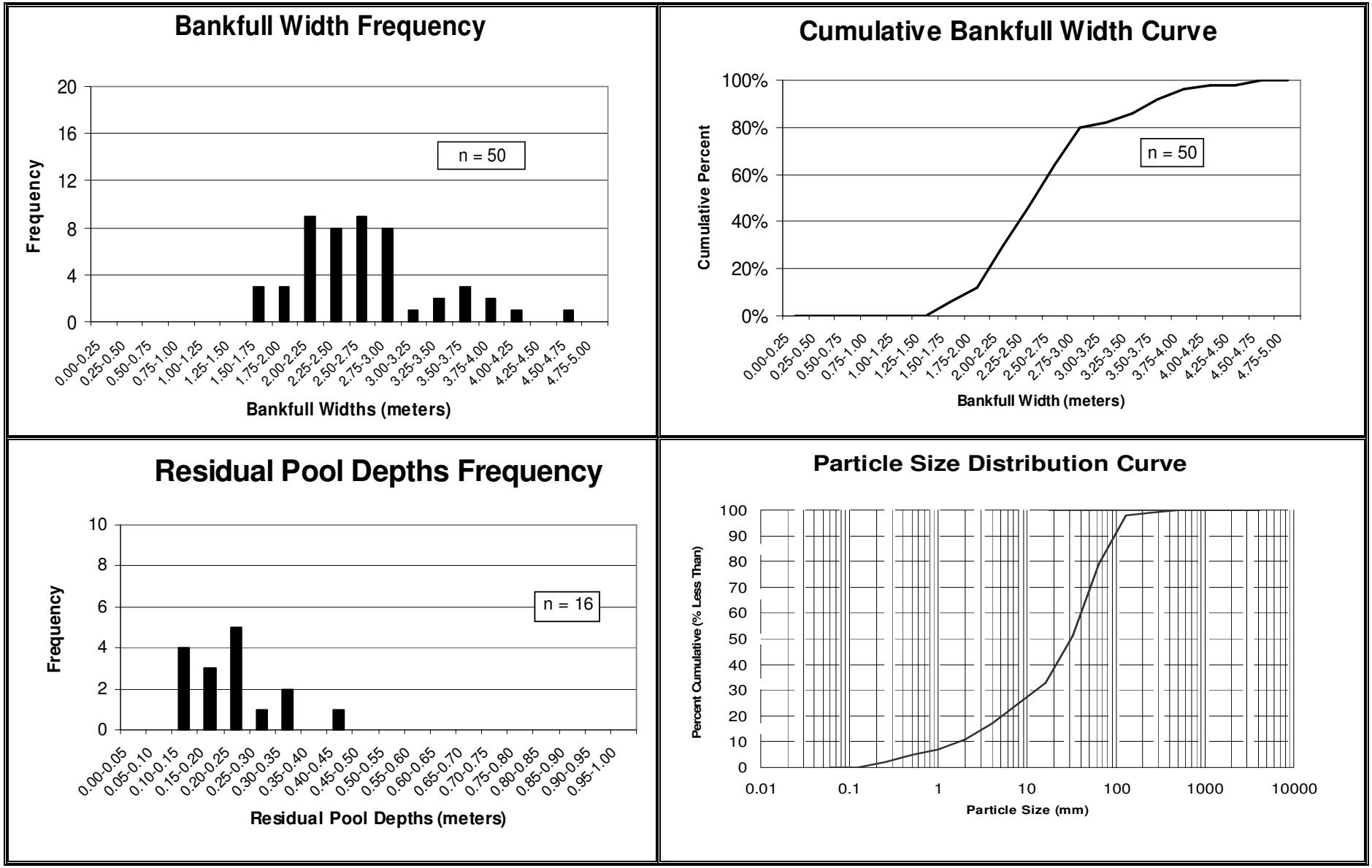


Figure 3.1. Stream Structure. Sample Bankfull Width Frequency, Cumulative Bankfull Width, Residual Pool Depth Frequency, Particle Size Distribution graphs for lower Bangtail Creek (September 24, 2008).

Specific 6th Code HUC Sub-watershed Descriptions and Fisheries Data

Upper Brackett Creek Sub-Watershed

Weasel Creek: Weasel Creek is a second order tributary to Brackett Creek. Only the small headwater tributaries to Weasel Creek are included within the Canyon Creek allotment. According to Shepard (2004), Weasel Creek is extremely small, dominated by groundwater (spring seep) flows. No fish were captured in Weasel Creek, but one Yellowstone cutthroat trout and one brook trout were captured in a small, unnamed tributary that enters Weasel Creek near its junction with Brackett Creek.

Skunk Creek: Skunk Creek is a third order tributary to Brackett Creek. Yellowstone cutthroat trout, brook trout, and mottled sculpin occupy this drainage (Shepard 2004). A sample of 13 Yellowstone cutthroat trout exhibited slight hybridization with rainbow trout. These cutthroat trout were determined to be 97 percent genetically pure. Both adult Yellowstone cutthroat trout and redds (spawning beds) were observed 3.9 km above the confluence with Brackett Creek. This site is located on a private land (inholding) upstream of the National Forest boundary. The habitat in the vicinity of this sample site was described by Shepard (2004) as lower quality with relatively poor streambank stability, high fine sediment levels within the streambed, high road densities with numerous channel crossings, and many portions of the forest adjacent to the channel had been clearcut. The headwater tributaries of Skunk Creek above the private inholding are presumed to be fishless because of their small size.

Miles Creek: Miles Creek is a third order tributary to Brackett Creek. Yellowstone cutthroat trout and mottled sculpin were the only fish species captured in Miles Creek (Shepard 2004). No fish were captured above the National Forest boundary. Tissue samples from 26 cutthroat trout collected downstream of river kilometer 5.8 indicated no evidence of genetic introgression from rainbow trout.

Only a very short reach of Miles Creek in the southeast corner of Section 23 and an unnamed tributary are managed by the Gallatin National Forest. Proper Function Condition assessments were conducted along these two reaches. Both stream reaches were determined to be functioning properly, although there was some minor cattle trailing impacts observed along the unnamed tributary.

Canyon Creek Sub-Watershed

Canyon Creek: Canyon Creek is a third order tributary to the Shields River. Brown trout, brook trout, Yellowstone cutthroat trout, and mottled sculpin inhabit this drainage (Shepard 2004). Genetic sampling of 25 cutthroat trout in 2001 indicate the population is 99 percent genetically pure hybridized with westslope cutthroat trout. The headwaters of Canyon Creek above the National Forest boundary appear to be fishless although suitable habitat exists. There is most likely an upstream barrier above river kilometer 17.0 where Montana Fish, Wildlife and Parks fisheries crews ended their sampling.

The headwater forks of Canyon Creek are high gradient with interspersed meadow reaches, steep hill slopes, and well armored stream banks. Little cattle impacts were observed above the National Forest boundary in 2008. Proper Functioning Condition assessments were conducted at fours sites along main Canyon Creek and an unnamed tributary. All fours sites were determined to be functioning properly with minimal cattle related impacts.

Grouse Creek: Grouse Creek is a first order tributary to Canyon Creek. According to Shepard (2004), brook trout, Yellowstone cutthroat trout, and mottled sculpin occupy lower Grouse Creek. Tissue samples from six cutthroat trout collected in Grouse Creek in 2001 indicate the population is genetically pure. An upstream migration barrier is located around river kilometer 2.4. Grouse Creek above the National Forest boundary is intermittent.

Bridgeman Creek: Bridgeman Creek is a first order tributary to Canyon Creek. Lower Bridgeman Creek supports brook trout, Yellowstone cutthroat trout, and mottled sculpin (Shepard 2004). An upstream migration barrier consisting of a series of very steep cascades is located near river kilometer 1.5. Bridgeman Creek above the National Forest boundary is intermittent.

Bangtail Creek sub-watershed

Bangtail Creek: Bangtail Creek is one of two primary fisheries within the five Bangtail allotments with North Fork of Willow Creek being the second.

Bangtail Creek is a second order tributary to the Shields River. The drainage has been extensively surveyed by Montana Fish, Wildlife and Parks and Gallatin National Forest personnel. Bangtail Creek supports populations of Yellowstone cutthroat trout, brook trout, and mottled sculpin. Analysis of 24 Yellowstone cutthroat trout collected throughout the drainage indicates the population is slightly introgressed by rainbow trout; however, it is unclear how far upstream this introgression extends (Shepard 2004). A long-term fish population monitoring reach (1999-2008) has been established above the Gallatin National Forest boundary to monitor Yellowstone cutthroat trout as well as brook trout expansion (table 3.8). Yellowstone cutthroat trout dominate the fishery at this particular reach since 2002. This reach is very productive based on population and biomass data.

Table 3.8. Bangtail Creek Electrofishing. Summary of electrofishing population estimates from Bangtail Creek above the Forest boundary between 1999 and 2008.

Stream	Date	Legal	# Trout (> 100 mm) per 100 m Total Length (mm) of All Fish (Min.-Max.)	
			Yellowstone Cutthroat Trout	Brook Trout
Bangtail Creek	07/07/99	T1N, R8E, Sec. 33 NE 1/4	28 (40-227)	37 (105-201)
	07/24/02	T1N, R8E, Sec. 33 NE 1/4	17 (55-245)	13 (53-245)
	07/25/06	T1N, R8E, Sec. 33 NE 1/4	23 (57-216)	19 (45-227)
	08/27/08	T1N, R8E, Sec. 33 NE 1/4	44 (62-253)	20 (47-267)

Stream gradient and valley width varies considerably along Bangtail Creek above the Forest boundary. The majority of Bangtail Creek is higher gradient consisting of B3 and A3 stream channels types with several shorter low gradient sinuous meadow stream channel types (C4, E4 and E5) interspersed.

Three reaches of Bangtail Creek above the Forest boundary were rated as Functioning-At-Risk with downward or static trend. These stream reaches exhibited characteristics such as increased bank erosion (both upper and lower banks), loss of sinuosity (meander cutting), channel down cutting, and channel over widening. The headwaters were extensively logged when privately owned in 1980's and 90's which may have resulted in changes to the natural hydrologic regime. In addition to the stream characteristic listed above, over a mile of Bangtail Creek dries up most summers starting about one mile above the National Forest boundary. It is unknown if this dewatering naturally occurred or it is a legacy affect from past timber harvesting or possibly a result of increased timber stand density within unlogged portions of the drainage. Stream channels within lower gradient reaches of Bangtail Creek where livestock tend to congregate have been over widened resulting from lose of herbaceous and deciduous vegetation and subsequent bank shear by grazing animals. It is believed that the current stream channel conditions are a cumulative result of several past activities not just livestock grazing.

Two stream channel monitoring reaches were established in 2008 along Bangtail Creek. The lower reach is located just above the Forest boundary, while the upper reach is located in a headwater meadow in NE ½ of Section 5 (Appendix 1 – Map 4):

Willow Creek sub-watershed

North Fork Willow Creek: North Fork Willow Creek is the second of two primary fisheries within the five Bangtail Mountain.

North Fork Willow Creek is a second order tributary to the Willow Creek which is a tributary to Shields River. All three forks have been extensively surveyed by Montana Fish, Wildlife and Parks below the Forest the boundary. North Fork Willow Creek supports populations of Yellowstone cutthroat trout and mottled sculpin. Analysis of 19 Yellowstone cutthroat trout collected throughout the drainage indicates that the population shows no sign of genetic introgression (Shepard 2004). The Yellowstone cutthroat trout population estimates were completed along two reaches of the North Fork Willow Creek in 2008 (table 3.9).

Four reaches of North Fork Willow Creek above the Forest boundary were rated as Functioning-At-Risk (Appendix 1 – Map 4). Three of the four reaches were exhibiting characteristics indicating an upward trend, whereas the fourth remains in a static condition. These stream reaches exhibited characteristics such increased bank erosion (both upper and lower banks), loss of sinuosity (meander cutting), channel down cutting, and channel over widening. The North Fork Willow Creek drainage is very similar to the Bangtail Creek drainage. Like the Bangtail Creek drainage,

Table 3.9. North Fork Willow Creek Electrofishing. Summary of two electrofishing population estimates from along North Fork Willow Creek in 2008.

Stream	Date	Legal	# Trout (> 100 mm) per 100 m Total Length (mm) of All Fish (Min.-Max.)	
			Yellowstone Cutthroat Trout	Brook Trout
North Fork Willow Creek	07/39/08	T1N, R8E, Sec. 9 NE 1/4	17 (74-232)	0
	08/28/08	T1N, R8E, Sec. 9 SW 1/4	28 (66-248)	0

the headwaters were extensively logged when privately owned in 1980's and 90's which may have resulted in changes to the natural hydrologic regime. A short reach of North Fork of Willow Creek also dries up most summers starting around the Forest boundary continuing downstream for approximately one quarter of a mile. It is unknown if this dewatering naturally occurred or it is a legacy affect from past timber harvesting or possibly a result of increased timber stand density within unlogged portions of the drainage. Stream channels within lower gradient reaches of North Fork Willow Creek where livestock tend to congregate have been over widened resulting from loss of herbaceous and deciduous vegetation and subsequent bank shear. It is believed that the current stream channel conditions are a cumulative result of several past activities not just livestock grazing.

Stream restoration work has occurred within the drainage over the last 15 years. Two 20-40 acre exclosures with were constructed in the 1990's along two meadow reaches that exhibited characteristics of a downward trend as a result of livestock grazing. The stream channel inside these two exclosures were determined to functioning properly when assessed during the summer of 2008. Several miles of unneeded work roads were obliterated while several stream fords were hardened and/or stabilized. Several pieces of large woody debris were strategically placed within the stream channel to increase the quantity and quality of pools. Several hundred feet of eroding unstable stream banks were covered with small trees and later planted with willow sprouts. Overall, the stream channel conditions along North Fork Willow Creek are improving but they are not where they should be or could be.

One stream channel monitoring reach was established in 2008 along North Fork Willow Creek. This reach is located just above the upper exclosure in the SW ¼ of Section 9 (Appendix 1 – Map 4). This is the same location as the upper electrofishing previously described. The stream channel at this monitoring reach was classified as a C4b (Rosgen).

Stream channel cross sectional data were collected along North Fork Willow Creek within the lower exclosure to monitor improvement. It is planned to re-measure these cross sections to quantify the improvement. Visually, dense willow stands exist today where no willows existed 15 years ago. The stream channel has narrowed substantially since establishment of the exclosure.

Middle Fork Willow Creek: Middle Fork Willow Creek is a first order tributary to Willow Creek which is a tributary to Shields River. Montana Fish, Wildlife and Parks found no fish along two sample reaches located near the mouth of the Middle Fork (Shepard 2004). Water is diverted year

around further upstream just below the Forest boundary. Although fish have not been documented above this diversion, suitable habitat does exist. With an exception of a short reach, upper Middle Fork is heavily timbered, steep side slopes, and narrow valley bottom. Cattle have minimal access to the upper reaches. Just above the private inholding in Section 15, the Middle Fork enters broad valley bottom meadow. At times, cattle tend to congregate against the allotment boundary fence. Although this stream reach was determined to be functioning-at-risk, it does exhibited characteristics of an improving trend.

South Fork Willow Creek: South Fork Willow Creek is a first order tributary to the Willow Creek which is a tributary to Shields River. The South Fork supports both Yellowstone cutthroat trout and mottled sculpin downstream of the Forest boundary (Shepard 2004). Tissues samples were collected from three Yellowstone cutthroat trout later determined to be genetically pure; however, the low sample size made it difficult to conclude with certainty that no introgression has occurred to this population (Shepard 2004). The South Fork above the Forest boundary is extremely small in size. The quarter mile stream reach immediately above the Forest boundary was determined to functioning-at-risk with a static trend.

Fleshman Creek sub-watershed

Fleshman Creek: Fleshman Creek is a third order tributary to the Yellowstone River. Fleshman Creek below the National Forest boundary is inhabited by a whole host of native and non-native fish species including Yellowstone cutthroat trout, rainbow trout, brook trout, brown trout, mottled sculpin and lake chubs according to Montana Fisheries Information System (MFISH) (http://fwp.mt.gov/fishing/mfish/). Yellowstone cutthroat trout within the drainage have not been genetically tested. According to MFISH, Yellowstone cutthroat trout are potentially hybridized since contaminating species are present within the drainage. Based on visually surveys and presence of marginal habitat conditions, it is believed that the reach of Fleshman Creek located above the National Forest boundary is fishless.

The headwater of Fleshman Creek above the Forest boundary was assessed at two locations using the Proper Functioning Condition Assessment methodology. The upper of the two reaches was determined to be non-functioning, whereas the lower reach was determined to functioning-at-risk (Appendix 1 – Map 4). The non-functioning determination for the upper reach was thought to be result of the improper location of a cattle trough. The cattle trough was installed adjacent to Fleshman Creek. Because of steep adjacent hill slopes, the only access cattle have to the water trough is by walking up and down the narrow valley bottom and/or Fleshman Creek. It is proposed to remove this trough to allow this area to recover.

Jackson Creek Sub-watershed

Jackson Creek: Jackson Creek is a second order tributary to Rocky Creek. Unlike previously described streams, Jackson Creek eventually flows in the upper Missouri River. Jackson Creek below the Forest boundary is inhabited by a full complement of native and non-native fish species (MFISH) (http://fwp.mt.gov/fishing/mfish/) including brook trout, brown trout, rainbow trout, longnose dace, mottled sculpin, mountain sucker, white sucker, and mountain whitefish. Only brook trout inhabit the headwaters of Jackson Creek located on the National Forest. That portion of

Jackson Creek located on the National Forest was determined to be properly functioning with no change in channel stability and very little evidence of cattle grazing.

Applicable Laws, Regulations, Policy and Forest Plan Direction Related to Water Resources

Clean Water Act and Montana Water Quality Act: The Clean Water Act provides the overall direction for the protection of waters of the United States, from both point and non-point source of water pollution. The Montana Water Quality Act (DEQ, 2006) establishes general guidelines for water quality protection in Montana. It requires the protection of Montana's water, as well as the full protection of existing and future beneficial uses. All of the streams within the analysis area are designated by Montana Department of Environmental Quality (DEQ) as B1 streams for water quality standards. The Administrative Rules of Montana (ARM 17.30.623) require that waters classified as B1 are suitable for drinking, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life; waterfowl and furbearers; and, agricultural and industrial water supply.

Presidential Executive Order 12962: Presidential Executive Order 12962, signed June 7, 1995, furthered the purpose of the Fish and Wildlife Act of 1956, the National Environmental Policy Act of 1969, and the Fish and Wildlife Coordination Act, seeking to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. This order directs Federal agencies to "improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing opportunity by evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order."

Sensitive Species: Sensitive species are those animal species identified by a Regional Forester for which population viability is a concern as evidenced by a significant current or predicted downward trend in population numbers, density, or in habitat capability that would reduce a species' existing distribution (FSM 2670.5.19). Ten species are listed as sensitive for Region 1.

Protection of sensitive species and their habitats is a response to the mandate of the National Forest Management Act (NFMA) to maintain viable populations of all native and desired non-native vertebrate species (36 CFR 219.19). The sensitive species program is intended to be pro-active by identifying potentially vulnerable species and taking positive action to prevent declines that would result in listing under the Endangered Species Act.

As part of the National Environmental Policy Act (NEPA) decision-making process, proposed Forest Service programs or activities are to be reviewed to determine how an action would affect any sensitive species (FSM 2670.32). The goal should be to avoid or minimize impacts to sensitive species. If impacts cannot be avoided, the degree of potential adverse effects on the species (and habitat) within the project area and for the species throughout its range must be disclosed. A viability analysis is required whenever a proposed project may adversely affect a sensitive species or its habitat. A given project can be approved even if it may adversely affect a sensitive species, but it must not jeopardize the viability (ability to persist through time) of a population or species.

Westslope cutthroat trout and Yellowstone cutthroat trout are classified as a sensitive species

throughout the Northern Region of the U.S. Forest Service. Westslope cutthroat trout historically occupied the west side of the Bangtail Mountains within the upper Missouri River Basin, whereas Yellowstone cutthroat trout presently occupy the east side within the Shields River drainage.

Implementation Strategy for the 1999 Westslope Cutthroat Trout Conservation Agreement/MOU within the Upper Missouri River Basin: The Memorandum of Understanding and Conservation Agreement (MOUCA) for Westslope Cutthroat Trout in Montana includes as objectives: 1) protecting all pure and slightly introgressed (90% or greater purity) westslope cutthroat trout populations; and, 2) ensuring the long-term persistence of westslope cutthroat within their native range. A letter from Bradley Powell (Forest Service Regional Forester) to Upper Missouri River Basin Forest Supervisors (January 16, 2002) articulates how Forests are to implement the MOUCA. In Section II: Implementation Strategy (Part B) states the when the above conditions are met, Forest Service Biological Evaluations (BE) (FSM 2670) and BLM Sensitive Species Assessments (6840 Manual) prepared for new activities in a WCT watershed should, in most cases, conclude that there will be a beneficial effect or no effect to the WCT population or its habitat (Powell 2002). The revision of allotment management plans is considered a new action under NEPA rather than an ongoing action. For new activities, the Strategy stipulates that the FS will: 1) Provide watersheds supporting conservation populations of WCT with the level of protection necessary to ensure their long-term persistence; 2) Defer any new federal land management action if it cannot be modified to prevent un-acceptable aquatic/riparian habitat degradation; and, 3) Where appropriate data are available, "high quality" habitat will be defined as habitat which is at 90 percent or greater of its inherent capability or potential. Later, the Implementation Strategy states "Actions that result in short-term impacts but are designed to obtain beneficial long-term effects to WCT should be judged against the criteria and optimum condition values characteristic of high quality habitat…"

Leadership on the Custer and Gallatin National Forests informally adopted this implementation strategy for Yellowstone cutthroat trout within their native range which includes the Shields River sub-basin.

Forest Direction:

Applicable forest wide goals (Forest Plan pp II-1, 2)

- Meet or exceed State of Montana water quality standards
- Maintain and enhance fish habitat to provide for an increased fish population

Applicable forest wide objectives (Forest Plan pp II-4,5)

- Fish habitat will be managed by application of "best management practices". Management standards have been set to mitigate impacts occurring to the fishery resource from land use activities.
- Management of livestock will consider utilization levels in riparian zones.
- Watersheds will be managed by application of "best management practices". Management standards have been set to mitigate impacts occurring to the watershed resource from land use activities.

Applicable forest wide standards (Forest Plan pp. II-18,19,20,23)

- Emphasis will be given to the management of special and unique wildlife habitats such as wallows, licks, talus, cliffs, caves, and riparian areas.
- Habitat that is essential for species identified in the Sensitive Species list developed for the Northern Region will be managed to maintain these species. These species include: Trumpeter Swan, Westslope and Yellowstone Cutthroat trout, Western Big Eared Bat, Spotted Bat, Ferruginous Hawk, Harlequin Duck, Boreal Owl, and Common Loon.
- The Forest will be managed to maintain and, where feasible, improve fish habitat capacity in order to achieve cooperative goals with the Montana Department of Fish, Wildlife, and Parks and to comply with State water quality standards.
- Livestock grazing in riparian areas will be controlled at levels of utilization listed in Management Area 7 (FP page III-19).
- Allotments with continuous grazing during the growing period will be evaluated and alternative grazing systems will be applied.
- Best management practices will be used on all Forest watersheds in the planning and implementation of project activities (FP Appendix C and planning records – "Watershed Management Guidelines for the Gallatin National Forest").

The Gallatin Forest Plan (1987) contains four stream classes A, B, C, and D intended to provide the needed specificity for management of the Forest's water quality and fishery resources consistent with the overall management goals in the Forest Plan. Since the Forest Plan was signed, this direction has been amended and reclassifies the streams into categories; A and B. This brought the Forest Plan into consistency with what the Montana DEQ considers essential for maintaining beneficial uses.

The new Forest Plan Standard is Standard M-1: Water, Fisheries, and Aquatic Life. In watersheds with streams currently at or above fish habitat management objectives, proposals for road and trail construction, reconstruction and maintenance would be designed to not exceed annual sediment delivery levels in excess of those in table 3.4.

Sixth Field Hydrologic Unit Codes (HUCs) are the standard analysis unit for sediment delivery (and other habitat parameters). Within the analysis unit, sediment delivery values in table 3.10 serve as guidelines. Sediment delivery values in individual smaller 7th Field HUCs may temporarily exceed sediment delivery rates denoted in table 3.10, in the following circumstances:

1. The 6th Field HUC does not contain a fragmented sensitive or MIS fish population;
2. The majority of 6th Field HUC's in the analysis unit remain within sediment delivery values listed in table 3.4;
3. Other core stream habitat (e.g. pool frequency, pool quality) or biotic (e.g. macro-invertebrates, fish populations) parameters within the 6th Field HUC do not indicate impairment as defined by Montana Department of Environmental Quality (MDEQ); and
4. Sediment delivery levels would return to values listed in table 3.4 within five years of project completion.

Table 3.10. Substrate sediment and sediment delivery by Forest stream category.

Stream Category	Management Objective (% of reference*)	Percent Fine Substrate Sediment (<6.3mm)	Annual % > Reference** Sediment Delivery
A Sensitive Species and/or Blue Ribbon fisheries	90%	0 – 26 %	30%
B All other streams (formerly Classes B, C, D)	75%	0 – 30 %	50%

*Percent of reference = percent similarity to mean reference condition; reference conditions range.
**Reference = observed relationship between substrate percent fines and modeled sediment delivery in reference (fully functioning) GNF watersheds.

Class A streams are those streams supporting a sensitive fish species or provide spawning or rearing habitat to the Gallatin, Madison, or Yellowstone Rivers, or Hebgen Lake. Class A streams are to be managed at a level which provides at least 90 percent of their inherent fish habitat capability. Class B streams are those streams that are regionally or locally significant and support both a quantity and quality fish populations or are characterized as having limited local significance and provide a diversity of lower quality dispersed fishing opportunity.

All streams that directly or indirectly flow in to the Shields River or the Yellowstone River are considered Category A streams because of the presence of Yellowstone cutthroat trout. All other streams within the analysis areas are considered Category B streams.

3.3 Terrestrial Animal Life

Management Indicator Species

Management Indicator Species (MIS) are identified as responsive to environmental perturbations, thus changes in populations can be indicative of effects from management actions. The Gallatin National Forest Plan identifies the following species as MIS: grizzly bear, bald eagle, elk, wild trout, northern goshawk and American marten (USDA 1987:II-19). A finding no impact was determined for grizzly bear, bald eagle and pine marten (Chapter 2.3). Wild trout are addressed above in Chapter 3.2. Goshawk and elk are addressed here.

Goshawks

Goshawks use large landscapes, integrating a diversity of vegetation types over several spatial scales to meet life cycle needs. Goshawk home ranges consist of the nest area, post fledging area (PFA), and foraging area. The nest area contains the occupied nest tree and may contain alternate nests within the same stand. Nest areas are typically characterized by mature forest with large trees, high canopy closure, and open understory. The nest area may be reused for several consecutive years (Squires and Kennedy 2006). The PFA surrounds the nest area and includes habitat used by goshawk families from the time nestlings leave the nest until juveniles become independent of

adults. The PFA serves as an area where young goshawks develop flying and hunting skills. Structural diversity in the understory appears to be important, possibly in terms of providing cover to protect the young from predators. (USDA 2007a). The foraging area is that used by goshawks to hunt for prey within their home range. The goshawk is considered a generalist, opportunistic predator; therefore, foraging areas are heterogeneous and may include mature forest components as well as a mix of other forest and non-forest components such as sagebrush, grasslands, riparian, and agricultural areas (Squires and Kennedy 2006). Mature forest stands with particular characteristics are typically selected for nesting habitat, but goshawks are considered habitat generalists at larger spatial scales. The project area contains suitable habitat for goshawks, but there are currently no known occupied goshawk nests in the Bangtail Range.

Elk

Elk, moose, and deer are native big game species that occur in the project area. Elk are identified in the Gallatin National Forest Plan as Management Indicator Species for big game (USDA 1987:II-18) under the premise that managing habitat for elk provides suitable habitat for multiple big game species. Elk are primarily grazers, consuming grasses and forbs for most of their diet, but using browse species as well, mainly in winter.

Elk winter range in the project area is characterized by lower elevation, warmer, drier slopes with south and west aspect. These slopes remain relatively free of snow, contain open areas of grass and shrub cover, and also have coniferous forest nearby to provide thermal and hiding cover. Elk winter range is found primarily at lower elevation in the Bangtail Range, both on the west slope and out into the Shields River Valley on the east side. The majority of elk winter range associated with the Bangtail area is in private ownership. Spring range for elk typically occurs in the transition zone between winter and summer range. Calving areas, which are part of spring range, occur at the upper elevational limits of winter range, where shrubs and conifers provide hiding cover to help protect calves from predation. Sage is an important habitat component of calving areas. Elk generally summer at higher elevations, where forage retains its nutritional value longer, and biting insects are less abundant. Although some elk summer in the Bangtails, many of the elk wintering in and around the Bangtails move to summer range in the Bridger Mountains to the west. Fall habitat for elk in the project area is generally represented by forested habitat that provides security cover as elk make their way to wintering areas.

Forage and security cover are the basic habitat components necessary for big game survival. Amount, quality, and distribution of forage and cover are all important factors. Neither forage nor cover is currently limiting in the project area. Security cover is represented by dense stands of coniferous forest, which provide hiding cover to escape from predators and other disturbance, as well as thermal cover to alleviate stress associated with extreme (hot or cold) temperatures. Forage is available in natural meadows, recent timber harvest units, and in naturally open forested stands.

Vegetation treatments have been used to remove brush species to improve forage for livestock. Sagebrush is often a crucial habitat component of calving and fawning habitat, since it provides cover for newborn ungulates while they are too young to be able to effectively escape predation. Roads and trails are used not only for livestock operations, but also for timber harvest, recreation and access to private lands. High motorized route density can influence big game habitat use and

distribution. Open motorized route density in the Bangtails is currently quite high at 3.3 mi/mi^2. This figure includes open roads and motorized trails on public and private lands. Implementation of the recently completed Gallatin National Forest Travel Management Plan is a reasonably foreseeable action. While road decommissioning has been completed, some construction and reconstruction of ATV trails is planned. Over 60 miles of roads have been decommissioned in the Bangtails and included many miles of old roads where motorized use was restricted. Addition of some new motorized routes under the Travel Management Plan would bring the total open motorized route density in the Bangtail Range to 3.4 mi/mi^2. Consolidation of private lands on the west side of the Bangtail Range has put virtually all of the big game winter range in private ownership. Potential for accelerated housing development on private land could impact wintering big game animals.

Applicable Laws, Regulation, Policy and Direction

The Gallatin Forest Plan contains goals to manage habitat for all indigenous wildlife species including increasing populations of big game animals, and to maintain or improve the forage resource for wildlife and livestock (Forest Plan Chapter II-1). The Forest Plan contains forest-wide standards to manage winter range to meet the forage and cover needs of big game species and to monitor MIS for population trends (Forest Plan Chapter II-18). In addition, the Forest Plan contains livestock utilization standards designed to allocate adequate forage for big game species (Forest Plan Chapter III-20, 34, 37, 52). The Northern Region Overview for Northern Goshawk (USDA 2007a) contains recommendations for managing goshawk habitat. The State (Montana Fish Wildlife and Parks) Elk Plan provides population goals and habitat management objectives for elk.

Migratory Bird Species

A January 2001 Executive Order requires agencies to ensure that environmental analyses evaluate the effects of federal actions and agency plans on migratory birds, with emphasis on species of concern. Species of concern include those listed under the Endangered Species Act, Forest Service Sensitive Species, Management Indicator Species and others identified as species of concern by the Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Most migratory bird species of concern are addressed in separate sections for Sensitive Species (bald eagle, trumpeter swan, harlequin duck, peregrine falcon, black-backed woodpecker, and flammulated owl dismissed as non issues in Chapter 2.3) or MIS (northern goshawk). This section deals with potential effects of livestock grazing on migratory bird species in general, emphasizing species of concern not addressed in other sections.

Migratory bird species are an extremely diverse group and as such, occupy all types of habitat available in the project area, including ponds, streams, wetlands, riparian areas, grasslands, shrub lands, deciduous forest, coniferous forest, mixed forest, and rock outcrops. Many migratory bird species use habitat within the Gallatin Forest as breeding grounds, while others breed in more northern climes and winter here. Some species are habitat specialists and are relatively restricted to certain cover types such as wetlands, riparian, forest interior or cliff habitat. Others are habitat generalists and can occupy a wide variety of cover types. Some bird species are extremely sensitive to habitat modifications and human disturbance, particularly in breeding areas, while others are much more tolerant of human intrusions, and might even benefit from habitat modifications

resulting from human activities.

Habitat in the Bangtail allotments has been grazed by domestic livestock for decades. The primary influence from livestock use is most evident in riparian areas, which are most commonly represented in the project area by narrow bands along mountain streams and lush thickets in upland areas near ponds, seeps or other persistent wet sites. Deciduous vegetation associated with riparian habitat includes cottonwood and aspen willow, alder, red-osier dogwood, common chokecherry, and black hawthorn. Sedges and forbs often dominate the herbaceous ground cover in riparian areas. Although it comprises a very small proportion of the landscape, riparian habitat represents a key component of migratory bird habitat through all seasons of the year. It provides breeding habitat in spring, foraging and brood-rearing habitat in summer, migratory stopover habitat in fall, and wintering habitat for species breeding in more northern climes. More than half of western landbird species breed exclusively or primarily in deciduous riparian habitat. Studies comparing riparian bird habitat with surrounding upland communities consistently report breeding bird species diversity and density to be much greater in riparian habitat (Tewksbury et al. 2002). Neotropical migrant landbirds are particularly dependent upon riparian habitat, and represent the majority of riparian-associated bird species detected in surveys in the USDA Forest Service Northern Region (Young et al. 2001).

Upland rangeland habitats are characterized by medium-height, woody shrub species such as sagebrush, rabbitbrush, and bitterbrush, and perennial bunchgrasses such as wheatgrass, bluegrass, needlegrass and fescue. Upland areas have been less impacted by livestock, although there have been some effects, primarily associated with noxious weed spread and conversion from native plant species to non-native species in some areas.

Forested habitat in the Bangtail Range is characterized by Douglas fir, limber pine and juniper in xeric sites at lower elevations. Mixed conifer (pine and fir) forests occupy more mesic sites at mid and higher elevations, while lodgepole pine is widespread and often dominant in disturbed areas. Forested areas have been the least influenced by grazing practices, and livestock use is most evident along forest edges where cattle often congregate to escape the heat or other weather-related factors.

Migratory bird species of concern include Threatened and Endangered Species, Forest Service sensitive species, and other species that warrant concern based on declining habitat and/or populations. Other than sensitive species and MIS addressed elsewhere in this report, species of concern that could be present in the project area include the Brewer's sparrow, grasshopper sparrow, olive-sided flycatcher, Cassin’s finch, Clark’s nutcracker, great gray owl, and Swainson's hawk. Brewer's sparrow and grasshopper sparrow are shrub (sage) and grassland nesting species respectively (USDA 1991). Nesting habitat for these species generally occurs on warm, dry, south and west-facing slopes at lower elevations in the project area. Olive-sided flycatchers are strongly associated with recently burned forest, but are also relatively common in logged areas, including clear-cuts and partial harvest treatments (Hutto and Young 1999). Cassin’s finch and Clark’s nutcrackers are associated with forested habitats at higher elevations (Ehrlich et al. 1988). Great gray owls typically nest in the more open structure associated with relatively dry, montane coniferous or deciduous forest. Nest sites are generally located in close proximity to open areas used for hunting. Foraging habitat consists of relatively open, grassy areas including natural meadows, logged areas and open forest (Duncan and Hayward 1994:164). Swainson's hawks

typically nest in lowland river bottom habitat that is not generally found on NFS lands but occurs in the rural and agricultural land adjacent to the project area. Swainson's hawks feed on small mammals, birds and insects. They commonly hunt in agricultural fields, and might occasionally enter the project area in search of prey.

For birds, the most direct effect of livestock grazing is the potential for trampling of nests and resulting mortality of young birds (Fondell and Ball 2004). Trampling impacts on nest success are positively correlated with stocking levels of grazing animals. Aside from trampling, birds generally do not respond to the presence of livestock per se, but rather to the impacts on vegetation that result from grazing. Livestock can directly remove plant materials, compact soil through hoof action, and indirectly reduce water filtration, which collectively can alter vegetative structure and reduce plant diversity (Saab et al. 1995). Due to these effects on vegetation, domestic livestock grazing practices are especially detrimental to bird species that require dense shrub or ground cover for nesting and/or foraging (Bock et al. 1992). Grazing effects on vegetation can limit the availability of suitable nest sites (Fondell and Ball 2004), impact foraging habitat and associated prey bases, and influence the behavior and success of nest predators and/or parasites (Ammon and Stacey 1997).

Impacts to habitat associated with livestock grazing can affect various bird species differently. Although livestock grazing impacts are known to affect some species negatively, some bird species respond positively, while others show weak or inconsistent responses to grazing (Saab et al. 1995). Species of concern such as Brewer's sparrow and grasshopper sparrow have shown negative response to livestock grazing. No specific results were reported for other species of concern. Impacts to breeding birds can vary based on habitat type affected (e.g. grass, shrub, riparian or coniferous forest); nest type (e.g. open nesting or cavity nesting); nest location (e.g. ground, shrub, or tree canopy); and foraging guild (e.g. insectivore, carnivore, nectarivore, or omnivore) (Ibid). Table 3.11 summarizes literature findings of livestock grazing impacts on various western bird species.

In general terms, long-distance migrant bird species tend to be more negatively affected by livestock grazing than either residents or short-distance migrants. This condition may be due to the tendency for residents and short-distance migrants to use cavity nests, whereas long-distance migrants use more vulnerable nest structures. Also, long-distance migrants may be energetically compromised upon arrival at the breeding grounds, and thus more susceptible to impacts related to livestock grazing (Saab et al. 1995). Multiple studies have found long-distance migrants to be significantly less abundant in grazed areas than in ungrazed areas in western states. Resident birds showed no significant differences in abundance between grazed and ungrazed sites, whereas short-distance migrants were generally less abundant at grazed sites, but not significantly so (Tewksbury et al. 2002).

Bird species that use an open nest structure generally have lower nest success than cavity-nesting species because the open nest structure is more vulnerable to nest predation and parasitism. Livestock grazing can further reduce reproductive success of open nesting species through physical damage to the nesting substrate typically selected by these species (Saab et al. 1995). Of the bird species of concern considered in this section, the Brewer's sparrow, grasshopper sparrow, Cassin's finch, Clark's nutcracker and olive-sided flycatcher all use open cup nest structures (Ehrlich et al.

Table 3.11. Western Bird Species Response to Livestock Grazing

Species	Res	Mechanism	Source
American Redstart	0/-	Inconsistent response, negative effects likely based on known habitat requirements	1
American Robin	+	Does well in open habitat, short grass	1
Brewer's Sparrow	-	Reduction in sage/shrub cover	1,4
Brown-headed Cowbird	+	Attracted to livestock, short grass	1
Common Yellowthroat	-	Parasitism, requires dense shrub cover	1,2,3,4
Dark-eyed Junco	-	Ground nester	1
Fox Sparrow	-	Ground or near-ground nester	1,3,4
Grasshopper Sparrow	-	Ground nester	3
Gray Catbird	0/-	Inconsistent response, negative effects likely based on known habitat requirements	1
Hermit Thrush	-	Ground nesting and foraging	1
Horned Lark	+	Requires short grass, open habitat	1
Killdeer	+	Preference for open habitat, short grass	1
Lazuli Bunting	-	Requires dense shrub cover, nest parasitism	4
Lincoln Sparrow	- +	Ground nester, requires dense shrub cover Negative relationship with shrub height	1,3,4,6 2
MacGillivray's Warbler	-	Requires dense shrub cover	4
Mountain Bluebird	- +	Conifer encroachment, loss of snags Forage on open ground	1 1
Nashville Warbler	-	Ground or near-ground nester	1,3,4
Northern Harrier	-	Ground nesting and foraging	1
Pine Siskin	+	Nests in tree canopy	1
Red-winged Black Bird	-	Nest parasitism	1
Savannah Sparrow	-	Ground nester, nest parasitism	1,3,4,5
Short-eared Owl	-	Ground nesting and foraging	1
Song Sparrow	-	Requires dense shrub habitat	2
Veery	-	Ground or near-ground nester	1,3,4
Vesper Sparrow	-	Ground nester	3
Violet-green Swallow	-	Conifer encroachment into open habitat	1
Western Meadowlark	-	Ground nester	1,3
White-crowned Sparrow	-	Ground nester	1,3,4
Willow Flycatcher	-	Parasitism, requires dense shrub cover	1,2,3,4,6
Wilson's Warbler	-	Requires dense shrub cover	4,6
Yellow Warbler	0/-	Inconsistent response, negative effects likely based on known habitat requirements	1,2
Yellow-breasted Chat	0/-	Inconsistent response, negative effects likely based on known habitat requirements	1,4

Response: - = negative, + = positive, 0 = weak or inconsistent response

Sources: (1) Saab et al. 1995 (2) Young et al. 2001 (3) Bock et al. 1992 (4) Dobkin 1994; (5) Fondell and Ball 2004 (6) Ammon and Stacey 1997

1988). Great gray owls and Swainson's hawks also have open nest structures, but because they are large, predatory birds, they are seldom impacted by nest predation, and brood parasitism is not an issue for these species. Nest height can also affect the influence of livestock grazing on bird habitat selection. Species nesting within 2.5 m (8 ft) of the ground were found to be significantly less abundant in grazed areas, while species nesting at least 5 m (16 ft) above ground were only slightly less abundant in grazed areas (Tewksbury et al. 2002). Grasshopper sparrows nest on the ground and Brewer's sparrows nest in shrubs within eight feet of the ground. Olive-sided flycatchers, Cassin's finch, Clark's nutcrackers, Swainson's hawks and great gray owls tend to nest in trees, generally at least eight feet, and often 16+ feet above the ground (Ehrlich et al. 1998).

Bird foraging habitat can be impacted by livestock use. In general, bird species that depend upon food resources directly (nectar, seeds, plants) or indirectly (insects) produced by understory vegetation are most likely to be affected by livestock grazing. Impacts to these species could have widespread ramifications because they are important pollinators and seed dispersers. Brewer's sparrow and grasshopper sparrow are species of concern that fit in this category. In contrast, aerial and bark insectivores, are relatively unaffected by grazing animals. Aerial insectivores, such as the olive-sided flycatcher, do not depend upon vegetation as a foraging substrate (Saab et al. 1995). Cassin's finch and Clark's nutcracker use a combination of ground gleaning, foliage gleaning and aerial foraging (Ehrlich et al. 1998). However, these species generally feed in forested environments not typically affected by livestock grazing. Great gray owls and Swainson's hawks prey mostly on rodents (Ibid). Livestock grazing can remove plants used by small mammals for nesting, foraging and security cover. Although livestock use may impact individual animals, grazing is not likely to affect small mammal populations. Livestock use may improve foraging opportunities for raptors by reducing the amount of herbaceous material that would provide concealment cover for small mammals.

Riparian habitats provide high levels of plant species diversity and productivity, primarily due to the biotic and nutrient exchange between aquatic areas and adjacent uplands. Riparian vegetation is extremely limited in extent, comprising less than 1 percent of the land area in the arid western states, yet this limited land type provides breeding habitat for more bird species than the extensive uplands. Livestock tend to overuse riparian areas relative to uplands, because riparian areas provide more water, shade, succulent vegetation and flatter terrain than upland sites (Saab et al. 1995). The most notable impact of livestock grazing in riparian habitat is the removal of lower vegetation layers through grazing, browsing and trampling. Continuous grazing repeated in the same areas over time compounds the problem by preventing recruitment of woody plant species, eventually causing decadence and senescence in the shrub and tree components of riparian systems. Long-term cattle grazing in riparian areas produces habitat that is structurally and taxonomically less diverse than habitat provided by intact riparian systems (Dobkin 1994). Over time, lack of tree recruitment in riparian habitat can affect the availability of large trees and snags used for nesting by species not typically impacted by the immediate effects of livestock grazing (Tewksbury et al. 2002). Grazing practices can further alter, or even eliminate riparian habitat through physical impacts to the water channel, such as channel widening, channel aggrading, or lowering the water table (Saab et al. 1995).

Short-term spring use in riparian areas can be less damaging to vegetation than continuous season long grazing. Early season use may provide better livestock distribution, since upland vegetation is

more succulent and attractive at that time, and livestock may tend to avoid wetter riparian areas. However, springtime grazing can have more severe impacts in terms of soil compaction and nest parasitism. Allowing livestock to congregate in riparian habitat during the summer months can result in severe trampling and mechanical damage to vegetation, as well as soil compaction, and over-consumption of herbaceous ground cover (Saab et al. 1995). Early fall livestock grazing can be detrimental to riparian vegetation, since cattle tend to congregate in riparian areas when adjacent upland vegetation dries out and becomes less palatable. As grasses and forbs become depleted, livestock switch to browsing on riparian shrubs, particularly willow. Browse pressure on riparian shrubs prior to leaf drop can reduce the residual plant cover necessary for maintaining stream bank integrity during subsequent high spring flows (Bock et al. 1992). Late fall or winter grazing in riparian habitat may have relatively little impact since plants are dormant, streambanks are generally dry and water levels are lower. These factors combine to minimize the impacts of browsing, erosion and soil compaction caused by livestock grazing. In addition, late season grazing occurs after the primary breeding season of migratory bird species (Saab et al. 1995).

Willow is a riparian habitat component associated with streams and mesic upland sites in the Bangtail Range. Willow communities provide important avian habitat in the project area and elsewhere across the Gallatin Forest. Tall willow in particular provides a wide shrub corridor that is especially attractive habitat for birds (Young et al. 2001). Livestock grazing can have detrimental effects on willow habitat because cattle not only forage on willow, but also tend to spend a disproportionate amount of time in wet or moist areas that support willow communities. Consequently, willow reduction is often the result of browsing, trampling and erosion associated with long-term grazing regimes (Ammon and Stacey 1997).

Young and associates (2001) found that shrub height and shrub density were both positively associated with about half the bird species identified in willow communities. The tall shrub layer tends to drop out first with increased grazing pressure, and total shrub density is strongly associated with grazing treatment. Saab and others (1995) reported little difference in population densities of habitat generalist bird species between decadent and healthy willow communities, but habitat specialist bird species were either rare or absent in decadent willow, whereas healthy willow communities supported high local densities of habitat specialists.

Cattle tend to browse the mid-layer (1-2 m; 2-6 ft tall) shrubs selected by habitat specialists such as the Willow flycatcher, and often trample or consume young plants, creating the club-shape willow form. In bird counts conducted across the Northern Region of the USDA Forest Service, the Willow Flycatcher was not located in any sites where shrubs were club-shaped due to livestock browsing (Young et al. 2001). Livestock grazing in willow riparian components could affect nest success by influencing nest site availability and nest predation rates. As willow cover is reduced by cattle use, birds might nest in less suitable habitat where young are more vulnerable. Also, livestock grazing in willow communities can alter habitat structure in a manner that can lead to changes in composition of predator assemblages and/or influence the search strategies used by nest predators (Ammon and Stacey 1997).

Density and diversity of migratory bird species is lower in grassland types than in wetland, riparian or coniferous forest habitats; however, Breeding Bird Survey data indicate that as a group, grassland species are showing more dramatic population declines than any other avian species assemblages in

North America (Saab et al. 1995). Since grassland bird species are ground nesters, trampling by livestock can have strong impacts on nest success of some bird species. In addition, livestock use removes material through grazing and trampling, thereby reducing vegetation density, which can indirectly affect nest success by impacting nest site availability, and may also influence nest predation and parasitism rates (Fondell and Ball 2004). Grasshopper sparrows are grassland associates, and are considered a species of concern in Montana.

Vegetation structure largely determines bird species abundance in grassland types. Intensive grazing by domestic livestock reduces the percent cover and vigor of grass species, and encourages seedling establishment of woody species such as juniper and Douglas fir. This condition can influence the fire regime by reducing or eliminating the fine fuels necessary to carry frequent, light intensity fires that maintain grasslands, and perpetuates the encroachment of conifer species into grassland types (Saab et al. 1995).

Bird species associated with grassland types respond differently to livestock grazing. Fondell and Ball (2004) found bird species requiring tall, dense ground cover for nest sites in higher densities at ungrazed sites, while birds that select for intermediate or short, sparse ground cover nested in higher densities in grazed areas. These authors determined that nest predation was responsible for the majority of nest failures for ground-nesting birds. Grazing can decrease vegetation height and density, which can result in increased predator efficiency by reducing the availability of suitable nest sites and/or impairing the concealment of existing nests. However, these impacts may be lessened by the birds' tendency to select suitable cover at nest sites regardless of grazing pressure (Ibid).

Livestock grazing can alter the structure and composition of shrubsteppe habitat, resulting in reduced perennial grass cover, loss of native seral grass species, reduced forb cover, elimination of the cryptogam layer, increased shrub cover, and invasion of exotic grasses and noxious weeds (Saab et al. 1995). Bird species that nest in herbaceous ground cover are most likely to be directly affected by livestock use in shrubsteppe environments through the selective removal of grasses and forbs by grazing animals (Bock et al. 1992). Birds that nest in shrubs may actually benefit from increased shrub cover that can result from livestock grazing. However, shrub-nesting species can be adversely affected by intensive grazing that removes most of the herbaceous ground cover. Some shrubsteppe bird species are highly selective for certain grass seeds; therefore, removal of grasses prior to seed development can be harmful to some bird species (Saab et al. 1995).

Dobkin (1994) found that the effect of sagebrush control on avifauna in shrubsteppe habitat seems to depend on the proportion of shrub cover removed. In Montana, treatment that removed 50 percent or less of the sage cover resulted in no discernable differences in nesting densities for bird species that comprised the majority of the breeding birds in shrubsteppe habitat studied. However, where all of the sagebrush was removed, the Brewer's Sparrow, which is a sagebrush obligate and a species of concern, declined by more than 50 percent the first year following treatment. Sagebrush removal has been used to improve range conditions for livestock in the past, but the practice has been limited in recent years. Season-long grazing practices can be particularly destructive in shrubsteppe habitat. Multi-pasture, rest-rotation systems can improve habitat conditions where season-long grazing has resulted in degradation of shrubsteppe habitat (Saab et al. 1995).

Livestock use in forested habitats can alter available nesting and foraging habitat by removing herbaceous and shrubby ground cover through consumption and trampling. Heavy use by livestock can reduce the amount of fine fuels required to carry fire. Altering the fire frequency can result in higher tree density, greater canopy closure, and a reduction in snags that provide cavity-nesting and roosting sites. On the other hand, trampling by livestock and/or browsing of young trees can reduce tree recruitment, which could affect development of future canopy layers. Bird species most likely affected are those that require herbaceous ground cover or shrubby understory for nesting and/or foraging, and those that select for open habitat rather than dense tree stocking. Birds that are probably unaffected by livestock grazing in the short term include those that nest or forage in the tree canopy and those that use aerial foraging techniques (Saab et al. 1995). Therefore species of concern such as the Cassin's finch, Clark's nutcracker, olive-sided flycatcher, great gray owl, and Swainson's hawk are not likely adversely affected by livestock grazing.

Brood parasites are birds that lay their eggs in the nests of other species, leaving the host species to rear their young. Obligate brood parasites are those species incapable of building their own nest, and so must depend upon other species to hatch and raise their young (Ehrlich et al. 1988). The Brown-headed Cowbird is an obligate brood parasite that is strongly associated with domestic livestock, particularly cattle, hence the name. Cowbirds are omnivores that feed primarily on insects and seeds. They typically forage on the ground in areas with short vegetation. Livestock provide cowbird foraging opportunities by flushing insects when grazing, producing a food source in manure and body parasites, and increasing insect abundance and visibility in grazed areas (Goguen and Mathews 1999).

Historically, cowbirds were associated with the American bison on the Great Plains. It is believed that the Great Plains area forms the historic distribution center for cowbirds and that expansion of the species to the west, east and south has occurred fairly recently (Robinson1999). Their recent appearance in western states has been attributed to the spread of human land uses, particularly agriculture and livestock. Cowbirds are now fairly common in south-central Montana, where landscapes are characterized as relatively dry, sparse forest with wide agricultural valleys (Young and Hutto 1999).

Brood parasitism by cowbirds results in host species fledging fewer young of their own. Some host species are much more vulnerable to nest parasitism than others, and population declines for vulnerable species have been at least partly attributed to impacts from cowbirds (Staab and Morrison 1999). In general, host species most vulnerable to cowbird parasitism are relatively small, passerine, open-cup nesters that breed in habitats frequented by cowbirds; e.g. agricultural areas, grasslands, riparian areas and open forests (J. Young, pers. comm. 2003). Of the species of concern emphasized in this section, the Brewer's sparrow, grasshopper sparrow and olive-sided flycatcher have been identified as cowbird hosts, although none was listed as a primary host (Ibid).

By far, the most frequently cited factor related to cowbird abundance and associated nest parasitism rates in western states is proximity to feeding sites, primarily agricultural areas (Robinson 1999 Goguen and Mathews 1999, Tewksbury et al. 1999, Young and Hutto 1999, Hejl and Young 1999, Tewksbury et al. 2002, Fondell and Ball 2004). Cowbirds are known to commute up to 7 km (4 mi) between feeding and breeding sites, but most flights are less than 2 km (1 mi) (Robinson 1999). Cowbirds are relatively common in the Bangtail allotment areas; however, impacts of brood

parasitism have not been studied in the project area. Large flocks of cowbirds typically occur where livestock are concentrated, which is most common on private lands within or below the allotment boundaries. Once cattle are turned onto National Forest System land they tend to disperse. Cowbird presence on NFS lands within the allotment boundaries is more likely to occur as individuals or pairs, rather than large flocks.

Many authors note the importance of livestock and associated cowbird impacts on migratory songbirds in riparian habitat (Saab et al. 1995, Young et al. 2001, Dobkin et al. 1998, Robinson 1999, Goguen and Mathews 1999, Tewksbury et al. 1999, Young and Hutto 1999). Concern for riparian habitat is based on a number of factors. Riparian habitats support high densities of cowbird host species, riparian bottom land is generally in close proximity to major agricultural areas where livestock tend to be concentrated during the onset of migratory bird breeding season, many riparian corridors are heavily grazed by livestock, cowbirds are one of the most abundant species detected in riparian habitat, and deciduous riparian vegetation can be relatively easy for cowbirds to locate host nests in. In grassland habitats, parasitism rates can have strong impacts on species that nest in high densities (Fondell and Ball 2004). Bock and associates (1992) note that the presence of livestock has increased cowbird contact with shrub-nesting bird species. Brewer's Sparrow is one of the most common species breeding in shrubsteppe habitat (Dobkin 1994), and is also a known host species for the Brown-headed Cowbird (J. Young, pers. comm. 2003).

It is possible that some western bird species avoid nest parasitism because cowbirds arrive too late in the breeding season (Robinson 1999). Cowbirds may arrive at breeding grounds in spring and survive several weeks without livestock. However, Goguen and Mathews (1999) found that female cowbirds postponed most egg-laying until after livestock were present. They theorized that this delayed breeding activity could indicate that the presence of livestock is necessary to produce the level of food availability required for female cowbirds to maintain egg production. Thus, earlier introduction of cattle in the spring could prolong the cowbird egg-laying season and result in greater overlap of cowbird and host breeding seasons. In Montana, the breeding season for migratory birds is completed by about mid-July (Hutto and Young 1998). Timing of cattle movement onto allotments could help manage the impacts of nest parasitism on migratory songbird populations.

Applicable Laws, Regulation, Policy and Direction

Management of migratory bird species and their habitats are governed by a wide variety of authorities. Most direction regarding conservation of these species falls under the umbrella of the Migratory Bird Treaty Act (16 USC 703-712) and an associated Presidential Executive Order. Under this Act, which implements various treaties and conventions for the protection of migratory birds, it is unlawful to take, kill or possess any migratory birds, except as regulated by authorized programs. Executive Order 13186 requires agencies to ensure that environmental analyses evaluate the effects of federal actions and agency plans on migratory birds, with emphasis on species of concern. The Gallatin Forest Plan (USDA 1987) identifies riparian habitat as Management Area 7 (MA 7). Forest Plan standards for MA 7 require us to maintain suitable habitats for those species of birds, mammals, and fish that are totally or partially dependent upon riparian areas for their existence (Forest Plan III-19).

Other Species of Interest (Predators)

The Bangtail Range hosts a variety of predatory species, including relatively large predators such as black bear, mountain lion bobcat, coyote and golden eagle, which are capable of causing conflicts with livestock.

The Bangtail Mountain Range is a relatively small, isolated range surrounded by agricultural, rural and urban development, yet it still provides habitat suitable to sustain a variety of predatory species. Mountain lions, black bears, bobcats and coyotes all thrive in the Bangtails today. Lions and bears are capable of preying on adult cattle, but rarely do so. Bobcats, coyotes and eagles may occasionally attack newborn calves, but again such events are rare. Regardless of which predator species is involved, most livestock depredations involve calves. Many predatory species scavenge on livestock carcasses resulting from natural or other causes. Due to the relatively small size of the Bangtail Range and wide distribution of livestock allotments, there is considerable opportunity for livestock/predator conflicts. However, the Bangtail Range contains healthy wildlife communities with a variety of native prey species for predators to hunt.

Applicable Laws, Regulation, Policy and Direction

The Animal Damage Control Act (ADCA) allows for the management of wild vertebrates that cause damage on National Forest System lands, including livestock depredation (46 Stat. 1468; 7 USC 426-426b). The Forest Service works cooperatively with the Wildlife Services branch of the Animal and Plant Health Inspection Service under a Memorandum of Understanding (MOU) to coordinate wildlife damage management on NFS lands (FS Agreement No. 04-MU-11132422-061). Under this MOU, the Gallatin National Forest and Wildlife Services prepare an Annual Wildlife Damage Management Plan.

Biodiversity

Biodiversity (or biological diversity) is a term defined by the Office of Technology and Assessment as “the variety and variability among living organisms and the ecological complexes in which they occur” (Hann, 1990). Biodiversity can be used as a measure of ecosystem health, and as such is often of great interest to our public.

The Bangtail Range is an isolated mountain range separated from contiguous mountain habitat by surrounding agricultural and rural land. Although isolated and disjunct, the Bangtail Range provides important connecting habitat between contiguous mountainous landscapes to the north and south. Vegetative structure and faunal occupation of the Bangtail Mountains has been influenced over time by a variety of human activities, including domestic livestock grazing. In spite of relatively high levels of human development within and surrounding the Bangtail Range, suitable habitat is still present for the entire suite of native fauna estimated to occur in this range prior to European settlement. However, because of the relatively small size and high level of human development in the Bangtails, this mountain range may no longer provide the large, undisturbed blocks of habitat required by some species. Notably absent from the Bangtails today are species such as the grizzly bear, wolf, bison and lynx. Some of the species that no longer occur in the Bangtails were eliminated from large portions of their historic range. Although some of the large,

charismatic species listed above no longer occur in the Bangtails, many large, wide-ranging animals still make regular use of the habitat available in this area. Such species include black bear, mountain lion, coyote, bobcat, moose, elk, and mule deer. The Bangtail Mountains are also home to a vast array of small mammals, birds, reptiles and amphibians.

Habitat composition is varied and diverse in the Bangtails, from drier grass and shrub fields converging with juniper, aspen limber pine and Douglas-fir forest on the warmer, west slopes, to moister meadows, aspen and coniferous forest dominated by lodgepole pine, spruce and subalpine fir on north and east slopes. The Bangtails lack the alpine habitat associated with higher elevations in other mountain ranges across the Forest. Cliffs, rock outcrops, water bodies, riparian and wetland types are minor habitat components in the Bangtail Range, but provide key habitat features for a large proportion of wildlife species inhabiting the area. Currently, the Bangtail allotments are dominated by open to dense coniferous forest of various structural stages. Non-forested types include grass, forb, and shrub dominated meadows, as well as small inclusions of deciduous tree and shrub species often associated with riparian areas and wetlands. Natural ecological processes, as well as human land uses, have influenced habitat diversity in the Bangtail Range over time. Some habitat changes are temporary, such as those produced by fire, wind, insects, and disease, while others are more permanent, such as those caused by human development. Habitat changes associated with livestock grazing in the Bangtail allotments include the conversion of native plant species to non-native species, and degradation of riparian habitats and associated streams.

Applicable Laws, Regulation, Policy and Direction

The National Forest Management Act (NFMA) requires federal agencies to provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives (16 USC 1604(g)(3)(B)). The Endangered Species Act (ESA 1973) requires the conservation of threatened and endangered species so as to maintain biodiversity. The National Environmental Policy Act (NEPA 1976) Title I, Sec. 101 (b) (4) relates the need to maintain, wherever possible, an environment which supports diversity.

3.4 Terrestrial Plant Life

Allotment Descriptions and Current Grazing Strategies

The Canyon, Stone, Willow Creek, Bangtail Creek and Jackson Creek make up the Bangtail Allotments. Canyon, Jackson Creek, Stone Creek and Bangtail Creek were originally sheep allotments. When Jackson Creek, Stone Creek and Bangtail Creek allotments were converted in the 1950's from sheep to cattle a conversion factor of four sheep per one cow was used. Canyon Creek Allotment was converted to cattle in 2001 with a conversion factor of 5 to 1.

Cattle and sheep use the land differently. Sheep can use steeper land than cattle, move across the landscape as a herd with a herder and grazed for a short season (2 months). Bed grounds were used for one or two nights. Different grazing impacts occur with sheep vs. cattle. Sheep graze grasses more closely than cattle and have less weight per hoof but more hooves on the ground with higher

Table 3.12. Improvements. Summary of Improvements and Opportunities for Improvements.

Allotment	Type	Status	Name	INFRA#	OWNERSHIP
Bangtail Creek Allotment	Spring	Undeveloped	1	0	Forest
Bangtail Creek Allotment	Tank	Functional	Clearcut Spring	601005	Forest
Bangtail Creek Allotment	Spring	Undeveloped	2	0	Forest
Bangtail Creek Allotment	Spring	Undeveloped	3	0	Forest
Bangtail Creek Allotment	Tank	Functional	4	601065	Forest
Bangtail Creek Allotment	Tank	Functional	5	601065	Forest
Bangtail Creek Allotment	Tank	Functional	6	601089	Forest
Bangtail Creek Allotment	Tank	Functional	7	601090	Forest
Canyon Creek Allotment	Tank	Functional	Bangtail Spring	601064	Forest
Canyon Creek Allotment	Tank	Functional	Grouse Spring	601010	Forest
Canyon Creek Allotment	Pond	Undeveloped	8	0	Forest
Canyon Creek Allotment	Spring	Undeveloped	9	0	Forest
Canyon Creek Allotment	Spring	Undeveloped	10	0	Forest
Canyon Creek Allotment	Tank	Needs Repair	11	0	Forest
Jackson Creek Allotment	Tank	Abandon	Boundary Spring	601014	Forest
Jackson Creek Allotment	Tank	Needs Repair	Pothole Spring	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	12	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	13	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	14	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	15	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	16	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	17	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	18	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	19	0	Forest
Jackson Creek Allotment	Tank	Needs Repair	Tubb Spring	601070	Forest
Jackson Creek Allotment	Spring	Undeveloped	20	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	21	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	22	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	23	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	Beysn Spring	0	Private
Jackson Creek Allotment	Tank	Needs Repair	Fleshman Spring	0	Forest
Jackson Creek Allotment	Spring	Undeveloped	Antler Spring	0	Private
Jackson Creek Allotment	Tank	Needs Repair	Bathtub Spring	0	Forest
Jackson Creek Allotment	Tank	Needs Repair	24	0	Forest
Jackson Creek Allotment	Tank	Needs Repair	25	0	Forest
Jackson Creek Allotment	Tank	Functional	Doyle Cabin Spring	0	Private
Jackson Creek Allotment	Spring	Undeveloped	26	0	Forest
Jackson Creek Allotment	Tank	Needs Repair	Grouse	0	Private
Stone Creek Allotment	Tank	Needs Repair	Jay Spring	601057	Forest
Stone Creek Allotment	Tank	Needs Repair	Angel Spring	601052	Forest
Stone Creek Allotment	Tank	Needs Repair	Stone Creek Spring	601056	Forest
Willow Creek Allotment	Tank	Functional	Harms Spring	0	Forest
Willow Creek Allotment	Spring	Undeveloped	27	0	Forest
Willow Creek Allotment	Tank	Functional	28	601092	Forest

sheep numbers. Allotment file notes indicate that bed grounds and grazing areas could show large areas of bare ground if used for more than 1 or 2 days.

Private lands in the Bangtail Mountains were logged and roaded extensively in the 1980's and 1990's removing many of the natural boundaries that formed allotment boundaries. Some fences have been built to contain cattle on their individual allotments, but cattle from other allotments or from adjacent private lands continue to find their way onto allotments where they are not permitted.

There are numerous improvements for livestock grazing in the allotments. The water developments and inventoried strings are displayed in tables 3.12. There are also 9.7 miles of fence included in the allotments.

Jackson Creek

The earliest grazing record for the Jackson Creek is a term permit in 1953 for 512 sheep and a note that the private permit had been canceled due to a change in livestock from sheep to cattle. Using the conversion factor of 4 to 1 that was used to convert sheep to cattle, sheep numbers probably totaled around 850. The west side of the allotment was permitted 139 cow/calf pair and the east side was permitted under an on/off permit for Fleshman Creek for 44 head (22 c/c on National Forest lands). Fleshman Creek most likely was managed as an on/off permit during this time because it was an isolated grazing area more closely connected to private land than other National Forest lands before logging and roads opened up access to other areas of the allotment.

Recent land exchanges and some past history of overuse and overstocking have influenced current grazing strategies. The Jackson Creek Allotment area includes National Forest System land along with an adjacent lease on private land owned by RY Timber.

During the 1970's, cattle numbers were increased to 196 cow/calf pairs and the grazing season was shortened to 7/8 to 9/22 for the west side of the allotment. An on/off permit continued for Fleshman Creek for 44 cow/calf pair and a season of 7/8 to 10/7 until 1997 when the on/off permit was cancelled. In 1997, permitted cattle numbers for the allotment were set at 218 c/c for a season of 7/8 to 9/22. Then, with the Gallatin Consolidated Land Exchange of 1998 the western portion of the allotment became private lands owned by RY Timber. This caused a reapportionment of grazing numbers between the term private land permit and National Forest term permit. Cattle numbers for the allotment should have stayed at 218 cow calf pairs but after RY Timber acquired the west side of the allotment, RY leased their land to the permittee for 138 c/c. This number plus 111 c/c permitted on National Forest land totaled 249 c/c pair. This number has been grazed from 2001 through 2008.

Jackson Creek is managed under a single pasture 2 month grazing system. Cattle are distributed across the allotment and moved to more lightly used areas by herding and salting. Generally, most cattle use occurs in the uplands and is within prescribed levels. The area around Jackson Spring was noted as having high use during 2 years after 2000 and several areas were above 45 percent in 2008. Most stock water improvements need maintenance. There are opportunities to develop springs in several areas. Current recommendations are that no more than 218 c/c pair be grazed for the season of 7/8 to 9/22.

Bangtail Creek and Willow Creek Allotments

Sheep were grazed on the Bangtail Allotment until 1952. About 1100 sheep were permitted for 60 days from June 25 through August 23. In 1953, livestock on the allotment changed from sheep to cattle. Cattle numbers fluctuated between 43 c/c and 80 c/c during the 1950's and 60's. The allotment boundaries during the sheep grazing days included parts of Canyon, Bridgeman and Bangtail allotments. In 1952, the boundaries changed to include only Bangtail Creek.

Until 1974 one permittee held permits to graze both Willow Creek and Bangtail Creek Allotments. At that time, parts of the Willow Creek Allotment that were accessible from the Bangtail area were withdrawn from the Willow Creek Allotment and added to the Bangtail Allotment. Cattle numbers were increased to165-175 c/c after this redistribution of lands in 1974. Cattle numbers were reduced to 150 c/c after the land exchange in late 1990s. The permitted season of use was July 1 through September 30 from the 1960's until 2004. From 2004-2007, the Bangtail permittee took three years of non-use in 2007. In 2007 this permittee sold his cattle and the Bangtail Allotment grazing permit was waived back to the government. Waiving the permit back to the Government provides the opportunity to use the Bangtail Allotment as a pasture for the adjacent Willow Creek Allotment to take pressure off of the North Fork and Middle Forks of Willow Creek.

The Bangtail Allotment had a history of high use on the private land native range in section 4. This area is currently not under permit nor is it fenced out of the allotment. Other areas of concern are streambank alteration along portions of Bangtail Creek. Bangtail Creek contains a genetically pure strain of Yellowstone cutthroat trout. Streambank alteration was above voluntary bank trampling guidelines in both 2007 and 2008.

The Willow Creek Allotment has been under permit since 1935 for 90 to 203 cow/calf pairs for a season of use of July 1 through October 15. During the 1930's, 198 to 203 cattle and horses grazed the allotment during the summers. Permittees were cautioned to leave 25 percent of the forage at the end of the grazing season. Notes in the file state: "Idaho fescue and bluebunch wheatgrass were the two best grasses to be found on the range but past years of overgrazing had badly depleted the range". In the 1970's cattle numbers were around 112. In the 1980's, the allotment was used for several years under a deferred grazing system where cattle were rotated from the Middle and South Fork of Willow Creek to the North Fork of Willow Creek. At one time a fence between the Middle and South Fork of Willow Creek was proposed but was never built.

Between 1972 and 1977, a temporary permit was issued for 36 six cows (16 cows NF lands, 20 cows private land) from October 6 through October 25 to graze on the Willow Creek Addition. The Willow Creek addition was noted as consisting of 51 acres of National Forest Land fenced in with 75 acres of RF Bar Ranch private land. These lands were located in the NE1/2 of section 10. These lands were not used during the regular grazing season, but were used after cattle were removed from the main part of the allotment. The grazing capacity for the Willow Creek addition was to be adjusted after proper use studies, but it does not appear proper use studies were ever conducted. After 1977, the Willow Creek addition was dropped from the permit. In 1984, an on/off permit for the National Forest lands included with RF Bar land in section 10 was proposed, but it doesn't appear this was ever implemented. These fences and lands may have been administered under a

special use permit. The grazing season of use was changed to a later turn on date of July 6 through October 5 due to the large amounts of larkspur present in the uplands in 1976.

Two riparian exclosures were built along the North Fork of Willow Creek in 1995 and 1998 in response to high cattle use along the creek. Three water developments were installed in the North Fork and Middle Fork after 1998. In 2005 and 2006, cattle numbers were increased and the grazing season shortened in an attempt to lessen the time cattle were in the pasture and lessen impacts on the creeks. Most of the livestock were removed by the off date but a few eluded attempts to find and remove them and stayed on the allotment until late September. Streambank trampling was similar to earlier years during 2005 but less along the North Fork in 2006. However, streambank trampling was higher along the Middle Fork than previous years in 2006. Factors influencing cattle use along the creeks is temperature and dryness of the summer, palatability of grasses in uplands vs. riparian areas, how often the permittee visits the allotment to remove cattle from the riparian area and where cattle are left after they enter a pasture.

Since 2003, the Bozeman District has measured streambank trampling on the streams in the Willow Creek Allotment in response to a Memorandum of Understanding and Conservation Agreement for westslope and Yellowstone cutthroat trout in Montana. Allowable trampling levels were set at 19 percent on Willow Creek streams. Trampling levels were met between September 6 and September 25 between 2003 and 2006 on the North Fork of Willow Creek and between July 24 and August 26 on the Middle Fork of Willow Creek during these years.

Vegetation utilization and streambank alteration along the streams has been high in the North and Middle Forks of the Willow Creek Allotment over the years. In 2008, cattle utilization on several native range areas in the uplands was above the prescribed level of 45 percent. Much of the vegetation on the Willow Creek Allotment is non-native timothy grass, which is not palatable for cattle when it matures and dries. In 2008 cattle entered the Willow Creek Allotment in mid August during the time timothy was not palatable to cattle. Native grasses were the preferred forage during this time; hence use on natives was above the prescribed limit.

In 2007 the Bangtail Allotment was combined with the Willow Creek Allotment under a deferred grazing system on a trial basis. One hundred cattle use the Bangtail Allotment for approximately six weeks and the Willow Creek Allotment for six weeks. The original intent was to alternate the stocking dates between the two allotments under the deferred system. This idea works when cattle are moved from Bangtail to Willow Creek but not the other way. Moving cattle from Willow Creek into Bangtail Creek is impractical because steep terrain and other logistical reasons.

The permittee is now hoping to secure the lease on private lands at the bottom of Bangtail and Willow Creeks. Securing this lease would allow the deferred system to work as proposed for 100 cow/calf pair. The deferred system would work like this. On years when the Willow Creek Allotment is grazed first the permittee would put 100 cow/calf pair in Willow Creek for the first half of the grazing season then push them back onto private land. The permittee would then move 100 pair from another herd on leased lands onto the Bangtail Allotment for the second half of the season. When the rotation is to use the Bangtail Allotment first, 100 pair would be driven up the ridge between Bangtail and Willow Creeks and left in the uplands for the first half of the season. Then cattle would be moved onto the Willow Creek Allotment for the last half of the season. Cattle

will need to be moved out of riparian areas on a regular basis, especially when the weather is hot and dry. Due to tall larkspur in the uplands, the permittee usually turns on after July 8.

Stone Creek

The Stone Creek Allotment was converted from a sheep allotment to a cattle allotment in the 1950's. Early use was for 155 head of cattle for a season of June 15 through September 15. In the 1980's, 251 yearlings were permitted for the Stone Creek Allotment for a season of July 1 through September 10. By the late 1980's cattle numbers were 78 cow/calf pair and 37 yearlings on a National Forest land permit and 136 yearlings under a private term permit. In 1997, one of the permittees waived his permit back to the government. The intent was not to restock the allotment with the waived numbers because of high use in areas of the allotment. Cattle numbers were reduced to 104 c/c for a season of July 1 through October 5. In 2000, after the Gallatin Consolidated Land Exchange the west side of Stone Creek became privately owned. Only about 380 acres of primary range on National Forest remained within the Stone Creek Allotment. These lands would only support 14 cow/calf pair. Since the majority landowner (RY Timber) was not interested in leasing their lands and Forest Service direction was to not issue grazing permits for less than 25 head of livestock, use was transferred from Stone Creek to the vacant Canyon Creek Allotment.

National Forest lands on Stone Creek Allotment are currently used for part of the season along with Canyon Creek Allotment. Use is generally light on the National Forest portion of Stone Creek Allotment. Lands to the west of the Allotment are owned by RY Timber and no fence separates the two ownerships. Cattle drift between the National Forest and RY lands. The permittee on the south end thought that using the south portion of Stone Creek Allotment in rotation with Canyon Allotment for two weeks at the beginning of the season or two weeks at the end of the season would work.

Several springs are located on the National Forest portion of Stone Creek Allotment. All need work to make them functional.

Canyon Creek Allotment

Canyon allotment was a sheep allotment from 1939 until 1994. Approximately 1100 ewes and lambs grazed the allotment during a season of July 1 through September 15. Due to predator problems and the permittee relocating his home ranch out of the Gallatin Valley, the permit was waived back to the government in 1999. In 2001, after the land exchanges in the late 1990s, cattle use was reassigned from the Stone Creek Allotment. This was done because RY Timber had acquired most of the Stone Creek Allotment and did not want to lease any lands for grazing.

The boundaries and landownership within the Canyon Creek Allotment have changed over the years. Today, two sections of private land are within the old Canyon Creek Allotment boundaries. These sections are not leased from the private landowner and are not included in the forage base for the allotment. Cattle access these sections as well as private lands within the Olsen Creek drainage since the lands are not fenced. Currently two permittees use two different areas of the Canyon Creek Allotment. One uses the north end of the Allotment and the other the south end (Appendix 1 – Map 2).

A total of 104 c/c pair graze the allotment for a season of 7/1 to 10/5. There are no stock tanks on the north end of the Allotment. Numerous streams provide water to livestock. The south end has two stock tanks.

Use on the Canyon Creek Allotment has been within prescribed levels since 2001. The north end permittee spent significant time and energy trying to keep cattle off of private section 24 in 2008 since he did not have a lease for that section. The landowner in section 15 is planning on fencing his land to keep cattle out in 2009.

Vegetative Conditions of Upland and Riparian Plant Communities

Livestock grazing has the potential to impact plants by physically damaging the plant through grazing or trampling, or by modifying the habitat in which the species grows. Some plants are tolerant of grazing while others are not. Livestock can preferentially graze certain plants causing a shift in plant community composition and succession. Certain levels of grazing can maintain species diversity of plant communities (Hobbs & Huenneke 1992).

Livestock grazing can alter the structure and species diversity of riparian plant communities. Riparian vegetation modification may directly remove fish security cover and reduce stream shading, resulting in increased water temperatures in summer and colder temperatures in winter. Riparian vegetation modification may indirectly result in reduced streambank stability and sediment filtering capacity of vegetation, both of which can result in increased sediment delivery rates. Riparian vegetation modification may also change stream channel form and function and may modify aquatic food webs and nutrient cycles. Removal of riparian vegetation may affect habitat for amphibians and also migratory birds.

Grazing alters the appearance, productivity and composition of upland plant communities. Livestock grazing may contribute to a decline in range condition if preferred forage plants are selected and grazed many times during the season and are not provided time to recover. Eventually, individual plants continually grazed become weak, die, and are replaced by more competitive plants such as introduced plants including noxious weeds. A recent analysis in the nearby Bridger Mountains indicated rangelands were rated as only fair to good condition because of noxious weeds and introduced plants (USDA 2007).

Vegetation Data Collection and Analysis

Vegetation data is currently being updated for National Forest System Lands in Montana east of the Continental Divide. The process is called vegetation mapping or VMAP. The update uses satellite imagery to draw polygons that identify variations in vegetation across the landscape. Tentative vegetation cover types are assigned to the polygons using existing data. Then additional data is collected to fine tune these cover types. Data collection for this project occurred in 2008 in the Bangtails. The final product should be available sometime in late 2009. Because we are still waiting for the final VMAP product we were not able to use it to identify vegetation cover types. We were however able to use the polygons to display areas of forest, open forest, and non forest areas and then assign forage production values these areas from data provided in the *Soils Survey of*

Gallatin National Forest, Montana (Davis and Shovic 1996). Digital color aerial photography maps from 2006 also aided in this process and allowed us to edit the satellite data (ArcGIS 9.2).

In the past, rangeland data was collected from Parker 3 Step transects and provided long-term monitoring data from 1957 through 1979 for the five allotments. No long term data has been collected since 1979. Eight of the original Parker 3 Step transects remain on National Forest land and could be reread and continued to be used to collect long term data. The other transects became private land in the Gallatin Land Consolidation Act of the late 1990s.

Variability of Rangeland Conditions

For this analysis, the area has been mapped to reflect forested and non forested areas. Depending on the amount of rainfall, early growing season temperatures and the time of year, different grasses and forbs within the vegetative community are dominant. Grasslands can and do change during the growing season and from year to year. Walker, Wilson and Mark 1999 found that seasonal changes in community characteristics and in the abundance of most species differ between years. Allen, Bastow and Mason (1995) found that the overall pattern of vegetation change showed considerable year to year variation. Fuhlendorf et. al. 1997 found that different grassland systems have different driving forces, which may respond at different spatial-temporal scales. Grass plots clipped in 2003 and 2005 in the Bridger Mountains to the northwest showed an increase in grass production of 63 percent and a 500 percent increase in forbs between 2003 and 2005. Plant composition in the Bangtails is influenced by the weather and land uses such as logging, recreation use and livestock use as well as other disturbances. Long term monitoring can indicate range trend.

Determination of Rangeland Health

Excellent condition. Soils well protected with no signs of erosion present, no noxious weeds present, plant species exhibit high vigor. Amount of litter present expected for the site and appears to be breaking down over one to two years. Native species expected for the site present at potential.

Good condition. Soil is well protected with little signs of erosion present, few noxious weeds present, plant species exhibit good vigor. Amount of litter present may be slightly higher or lower than expected for the site and appears to be breaking down over one to two years. Native species expected for the site are present with high similarity to potential. Few introduced plants present.

Fair condition. Some erosion may be present. Litter depths may be above or below the amount expected for the site. A sample plot may have a higher amount of bare spaces than what is expected for the site. Native species expected for the site are present with moderate similarity to potential. Noxious weeds may be present in small amounts (trace to 2 percent). Some increaser plants present in very small amounts. Increaser plants are plants such as dandelion, yarrow, stickseed forget-me-not, chickweed and goldenrod.

Poor condition. Soil erosion present, community exhibits a large amount of bare spaces between plants above what would be expected for the site, plants exhibit poor vigor, large amount of increaser plants and/or noxious weeds are present. Litter may be absent or too much may be present

so that it is not breaking down over several years. Few native species expected for the site are present with low similarity to potential.

Most of the rangelands in the uplands of the Bangtail Allotments are in good condition. Grasslands at the higher elevations of the Bangtails contain native species at high similarity to potential. Soil erosion is not present in these areas. Noxious weeds may be present in some areas but are mainly found along roadways or a short distance from roads. Noxious weeds most commonly encountered are Canada thistle and houndstongue, although St. John's wort, spotted knapweed and tansy are found in some areas. Sulfur cinquefoil and leafy spurge are found along access roads to the east of Bangtail and Willow Creek allotments (NRIS Database 2008).

A few areas of poor condition rangelands are found along mid and lower slopes. Several of these areas have high densities of the noxious weeds. Spotted knapweed is found mainly along several sections of logging roads. Several of the valley bottoms contain areas of timothy with high densities of houndstongue. Some areas of poor condition range occur on the east side of the Bangtail ridge where snow drifts accumulate. These areas contain areas of bare soil and evidence of soil erosion. These areas usually have large cornices and snow drifts late into the season, which influences the type and amount of vegetation that grows on these areas.

Timothy areas would be classified as fair to poor condition rangeland due to low to moderate similarity to potential. Timothy is a dominant nonnative species in areas of deeper soils and on benches throughout the analysis area. Historically, these may have been livestock concentration areas. Timothy may have been intentionally seeded in these areas to reduce erosion, and create forage for livestock. Whatever the reason for its establishment, it has taken over many areas of deeper soils. Timothy is now considered a part of the native community but is not a preferred species. In many cases nothing short of cultivating the site and reseeding with more desirable species would be needed to reduce its cover. Because timothy becomes less palatable to livestock as it matures, early season grazing prior to seed set may be a tactic for reducing the occurrence of this species. However, larkspur is commonly found in timothy areas and is poisonous when eaten by livestock. Many permittees are reluctant to turn livestock onto grazing allotments until after larkspur blooms and grasses are more prevalent.

In addition to the timothy, other non-native plants include Kentucky bluegrass, dandelion, salsify, cheatgrass, white clover, meadow foxtail, sowthistle and dock. Even without livestock use, these species can persist and continue to remain in the plant community (personal correspondence, Clark). Westoby et. al. (1989) found that when livestock are removed from some areas, vegetation has not changed at all or may not change in the direction predicted by the Clementsian model. The Clementsian model predicts that succession is affected by grazing; that range condition can be modified continuously and reversible by adjusting stocking rate; and that the removal of livestock allows plant communities to move to Potential Natural Condition or climax condition. Westoby et. al. (1989) argues that range systems are more complex with multiple dynamics responsible for range condition. Multiple dynamics involve competition, fire, vegetation changes that trigger persistent changes in soil properties, rare climactic events as well as grazing.

Utilization measurements in the Bangtail Allotments over the past 10 years show that many areas receive little use, some moderate use and some near water sources and native range areas receive

heavier use (2210 District files). Heavy use may also occur during drought in areas where grasses remain green longer into the season, such as the edges of timber and riparian areas. These areas can receive heavy utilization in late August and early September. Generally, by mid September or after late summer rains, cattle move back into timothy areas to graze.

Vegetation surveys during the 1960's and 1970's indicate that Kentucky bluegrass was found on a few transects, timothy was noted on one transect and houndstongue noted on one transect. Transects were rated as being in excellent to fair condition depending on the amount of higher seral plants present. Soil conditions were rated as being in excellent to fair conditions depending on the site and the amount of grazing occurring on the site or that had historically occurred on that site. Several transects were noted as having pedestalled plants and signs of past soil erosion, but noted soils were soils healing during the 1970's (2210 range files).

Noxious weeds, timothy and Kentucky bluegrass may have increased in the past 30 to 40 years with recent observations indicating more occurrences. However, due to different data collection methods, it is not possible to make this statement with confidence. If noxious weeds and non-natives have increased, it is possible that the drought of the 1990's-2007 may have favored the expression of introduced and noxious weeds. It is also possible that current management of livestock in this area may be contributing to an increase in noxious weeds and non-native plants. This trend needs to be assessed by long term monitoring.

Even though many plant communities today are made up of non-native plants, most vegetative communities are performing the basic functions of soil protection, mineral cycling, organic matter accumulation and wildlife food production. The concern is noxious weeds and their potential increase on the landscape. This factor, more than other introduced plants, has the potential to seriously alter the landscape, forage production, esthetic values and range health of the area.

Conifer Encroachment into Rangelands

It is common knowledge that fire suppression has allowed conifers to establish in areas never before occupied by forests. There is documentation indicating that livestock grazing also contributes to encroachment (Belsky and Blumenthal 1997). Conifer encroachment is common on drier areas, along the edges of grassland parks and in more gentle terrain areas of timothy and sagebrush. This situation has reduced the amount of available forage for livestock and wild ungulates (Project File – Vegetation). Encroachment also has reduced the amount of ground water recharge to streams, altered fire regimes (Bradley, et. al. 1992), and reduced the number of seral conifers including rocky mountain juniper and limber pine (Project File - Vegetation). Limber pine is further threatened by exotic white pine blister rust and a mountain pine beetle epidemic. A close relative, whitebark pine, may be petitioned for listing on the Federal Threatened and Endangered Species List.

Many areas of forest in the Bangtails appear to be "new" young forests 80 – 120 years old. Historically many of these areas were not forested. They have no large old trees, no old stumps, and no large downed woody material characteristic of areas historically occupied by forest. Small openings in these forested areas are still occupied by rangeland species such as bunch grasses, sage brush and snowberry species typical of rangelands. A study in the Centennial Mountains about 80 miles to the south showed similar conditions (Gallant et. al. 2003). Using historic mapping, that

study found that conifer forests of mostly Douglas-fir had expanded in the study area by about 20 percent over the last 100 years (Gallant et. al. 2003). In the Bangtails, this process continues. The edges of these forests often have young conifers becoming established in adjacent sagebrush; evidence of expanding encroachment. Most of the expansion of conifers appears to be happening on steeper slopes.

An assessment of those areas with potential conifer encroachment was conducted using ArcGIS (ArcGIS 9.2) and some field reconnaissance. Southerly aspects in the Bangtails typically have very open conditions with only scattered trees because of increased solar radiation. Drier conditions also supports more frequent fire regimes resulting in few trees and trees adapted to more frequent disturbances (Bradley, et. al. 1992). Southerly aspects and many areas of sagebrush on more gentle terrain were inspected for encroachment issues (ArcGIS 9.2). Using field observations, 2006 aerial photo mapping (NAIP) and 10 meter resolution digital elevation models we were able to identify many areas where Douglas-fir forest was tentatively identified as encroachment. It is evident that conifers, particularly Douglas-fir may now occupy substantially more land area than they did historically. The following table summarizes potential areas of conifer encroachment across the five allotments on National Forest.

Table 3.13. Conifer encroachment estimates.

Allotment	Ownership	Sum Of Acres
Bangtail Creek Allotment	Forest	429
Canyon Creek Allotment	Forest	390
Jackson Creek Allotment	Forest	1,962
Stone Creek Allotment	Forest	648
Willow Creek Allotment	Forest	1,133
Total Encroachment Estimate		**4,562**

It should also be noted that forested areas on private land throughout the Bangtail Mountains have been extensively logged and very few large patches of intact forest exist. Some sections were clearcut as private ownership and have since been exchanged to the Forest Service.

Bangtails Livestock Suitability and Capability determination

A livestock grazing suitability and capability analysis was conducted to estimate where and how many livestock could be grazed on the allotments. This evaluation is based upon: vegetation classification (Project File-Vegetation shapefiles); Forest Service Manual and Handbook direction; the Gallatin National Forest soil surveys (Davis and Shovic 1996); and, past monitoring of utilization and rangeland conditions (District Rangeland Monitoring Data 1982-2008). Evaluating rangeland suitability and capability requires information on the vegetation, soils and geography of the landscape. Most of this process was completed using Geographic Information Systems (GIS) computer technology (ArcGIS 9.2)

Soil compaction, overgrazing, etc. can cause losses in productivity. Some areas of compaction occur around water tanks and areas of mineral placements but these are very limited. Based on field

observations by District personnel, the total amount of acres of concentrated livestock use amounts to a few acres and this is scattered across the five allotments with most areas amounting to less than an acre. Also, cattle are grazed during the drier months beginning in July, grazing under drier conditions reduces the likelihood of compaction. Therefore, compaction does not appear to be an issue and suitability and capability estimates concentrated on vegetation and geography.

The land areas included in the analysis include only National Forest System Lands.

Vegetation Classification and Animal Unit Month Calculation (AUM)

Region 1 is currently updating vegetation mapping (VMAP 2008). At this point the only data available are polygons and draft cover types generated from 2005 satellite imagery. The polygons identify changes in vegetation across the landscapes. Draft cover types have been assigned to each polygon and are currently being field verified to improve accuracy of the mapping. Final mapping is scheduled to be completed over the next year.

Although the mapping process has not been completed we were able to use the base map polygons generated from the satellite data. The polygons breakout forested and non forested vegetation and all levels in between. For the purpose of this analysis we included non-forested areas and areas of open forest with a component of non forest plant communities. Some logged areas were included in the analyses that are still open enough for livestock to graze. Many logged areas now have trees large enough to be identified from the satellite data and were not included in our calculations. Some portions of roads were included indirectly as part of other polygons. All the vegetation polygons where then intersected with soils data (Davis and Shovic 1996, ArcGIS 9.2).

Only National Forest lands were used to calculate AUMs. There are about 8,204 acres of primary rangelands and 2,599 acres of secondary rangelands on the National Forest within the allotment boundaries (Project File – Vegetation).

In 1996 the "*Soil Survey of Gallatin National Forest, Montana*" was completed and included forage production by soils classification in Appendix Table 10 of the document. Each soil class was assigned a dry weight forage value (Davis and Shovic 1996). These values were used to estimate rangeland forage production across the allotments. While these figures appear to be very conservative we used them because we did not want to over estimate potential stocking levels and this was the most consistent and documented production values we could find. Also, forage production can vary greatly from year to year and data collected on the allotments was highly variable and in some cases decades old. Another reason we used this data is that soils are tied to productivity. Therefore, soils and related productivities became an integral part of our calculations.

Forage production data associated with each soil type from Davis and Shovic (1996) was assigned to every vegetation polygon across the five allotments (ArcGIS 9.2). This was done by intersecting data layers in a computer. Calculations were then completed that included a maximum of 25 percent average utilization of all grass species and a forage consumption rate for a cow calf pair of 975 pounds per month. Calculations provided an estimate of animal unit months which in this case is the amount of forage need to sustain one cow/calf pair for one month:

Lbs of dry forage per acre for each soil type x Utilization = Useable forage/acre

$$\frac{\text{975 lbs forage/per month consumption}}{\text{Useable forage/acre}} = \text{Acres/animal unit month}$$

Acres/animal unit month/Acres of forage available = Animal Unit Months (AUMs)

Once the AUMs were calculated we identified those areas of primary and secondary rangelands. This was identified based on vegetation and slope. Distance to water is often used but water is not limiting in this area. Those areas of open forest and/or over 40 percent slope were classified as secondary rangelands. Secondary rangelands are used by livestock but are not part of the stocking estimates. Calculations of AUMs are in the following table 3.14. Animal Unit Months that are in bold indicate more AUMs of use are allowed that is indicated by our updated suitability and capability analysis. The Bangtail and Jackson Creek Allotments appear to be overstocked based on the AUM calculation conducted for this . However, monitoring does not support this finding since over grazing is not evident (District 2200 Files). An explanation might be that we used very conservative forage production levels when we did our calculations. Productivity estimates were based on sampling conducted for the Gallatin Soil Survey (Davis and Shovic 1996). Logged areas used by livestock (transitory range) were estimated to be only 25 percent accessible because of regeneration, downed woody material, etc. A utilization level of 25 percent was used in the AUMs calculations meaning we assumed only 25 percent of the available forage was available for livestock consumption.

Table 3.14. Summary of AUMs. The table displays Animal Unit Months of forage available for rangelands on National Forest.

Allotment	Ownership	Primary or Secondary Range	AUMs of Forage Available	AUMs of Use Currently Permitted	Primary Range Potential AUMS of Over or Under Stocking
Bangtail Creek Allotment	Forest	Primary	115	**193**	**+48**
Bangtail Creek Allotment	Forest	Secondary	30		
Canyon Creek Allotment	Forest	Primary	382	372	-61
Canyon Creek Allotment	Forest	Secondary	51		
Jackson Creek Allotment	Forest	Primary	205	**376**	**+86**
Jackson Creek Allotment	Forest	Secondary	85		
Stone Creek Allotment	Forest	Primary	98	48	-82
Stone Creek Allotment	Forest	Secondary	32		
Willow Creek Allotment	Forest	Primary	182	211	-81
Willow Creek Allotment	Forest	Secondary	110		

Past Monitoring of Utilization and Rangeland Condition

Many years of allotment administration monitoring data is available for review in the District range files (FSM 2280). These data were reviewed to determine if there were patterns of over or under utilization that would indicate stocking level or livestock distribution problems. The Jackson Creek, Bangtail and Willow Creek allotments have had small, isolated areas of over utilization occurring

on native range areas during drier years. Use on the Stone Creek and the Canyon Creek Allotments is usually within the standards set in the current Allotment Management Plan. During drought years, use in riparian areas has been above guidelines for the Memorandum of Understanding for the Conservation Plan for Management of West Slope Trout for the Bangtail and Willow Creek Allotments. Under the Terms and Conditions of the Grazing permit Part 8 (c), the permittee is required to remove livestock from Forest Service administered lands before the expiration of the designated grazing season upon the request of the Forest officer when it is apparent that further grazing will damage the resources.

Riparian areas are the plant communities most sensitive to grazing. During warm weather livestock concentrate in these areas and it can become difficult to keep livestock from loitering which leads to overuse and damage to riparian plants. Many strategies are used to keep livestock distributed more evenly and out of riparian areas. Mineral placements, water developments, riparian exclosures, and bank stabilization projects are currently being used on the allotments. Some of these projects are too recent to see results. Two exclosures on the North Fork of Willow Creek have been successful in improving riparian habitat.

Non native vegetation is common throughout all the allotments. Smooth brome, timothy, Kentucky blue grasses are common. Areas dominated by cheat grass are present but isolated to disturbed sites and underneath large trees where other plants grow at very low densities. Some of the more productive sites are dominated by non native timothy which is less palatable to cattle than other native species during hot, dry summers. Several species of plants listed on Montana's noxious weed list have been inventoried in the allotments. Noxious weed species of houndstongue, spotted knapweed and tansy are found along roads. A small patch of leafy spurge of less than a tenth of an acre is located on the east side of the Bangtail allotment. Scattered patches of St John's wort is found in the lower part of Bangtail allotment. The largest infestation is about two tenths of an acre. Noxious weeds are discussed in more detail in the next section of this document.

Noxious Weeds and other Invasive Non-native plants

Issue Discussion for Invasive Plants

Livestock are recognized as one of many pathways contributing to the establishment and expansion of noxious weeds (Olsen 1999, Belsky and Gelbard 2000, National Strategy and Implementation Plan for Invasive Species Management 2004, Freilich et. el. 2003). Invasive plant and animal species have been recognized by the USDA Forest Service as one of the four critical threats to the Nation's ecosystems (Four Threats to the Health of the Nation's Forests and Grasslands 2004). In response, the Forest Service has taken a leading role in addressing invasive species at the local, state, and national levels, as well as internationally. The Forest Service uses a strategic and integrated approach to reduce the threat of invasive species. Forest Service Manual (FSM) 2081.2 provides Forest Service guidance for noxious weed prevention and control. A required practice of FSM 2081.2 is to include a weed risk assessment in environmental analysis for rangeland projects.

Livestock may bring seed into an area either on their coats or in their feces and may create microsites for nonnative seeds to germinate (Hobbs & Huenneke 1992). Disturbances increase resource availability and decrease competition from resident species, thus facilitating the

colonization by weedy species with greater competitive abilities than the natives. The amount of bare ground created by soil disturbances has been shown to directly control the abundance of invading species. (Prieur-Richard and Lavorel 2000). The greatest resistance to invasion of nonnative plants was found in highly productive communities with moderate levels of disturbance, which also had the highest number of species present (Prieur-Richard& Lavorel 2000).

Sheley et. al (2005) describe weeds as "… plants that interfere with the management objectives of a given area of land. Noxious weeds are those weeds that society has declared as our legal responsibility to manage because of their negative impacts. In most cases, noxious weeds evolved in other countries where the pressures from the environment cause them to develop aggressive and invasive characteristics. Noxious weeds are spreading like biological wildfire and are out of control in many areas of North America."

Noxious weeds cause a number of potentially significant problems. According to Sheley et. al. (2005) noxious weeds:

- displace native plants
- reduce biodiversity
- affect threatened and endangered species
- alter normal ecological processes (e.g., nutrient cycling, water cycling)
- decrease wildlife habitat
- reduce recreational value
- increase soil erosion and stream sedimentation
- cause major economic losses.

Additional information can be found on the web at http://www.weedawareness.org.

The Forest Service's response to invasive species is contained in the National Strategy and Implementation Plan for Invasive Species Management launched in October 2004. This is an aggressive strategy that harnesses the capabilities of the Forest Service (Four Threats to the Health of the Nation's Forests and Grasslands 2004). For more information on the Forest Service National Invasive Species program, visit http://www.fs.fed.us/invasivespecies/index.shtml.

Tables 3.15, 3.16, 3.17 and 3.18 display existing known populations of weeds and areas of recent disturbance where weeds may become established. Roads are conic sources of weeds therefore it is assumed that all roads have some level of weed infestations. Inventories of weeds are conducted formally or informally in association with other activities such as range allotment administration, timber sale administration, weed suppression, etc. Inventories are formally tracked in the Forest Service's Natural Resource Information System's TES Plant/Invasives database. Efficacy of weed treatments is tracked in the Threatened, Endangered Sensitive Plant/Invasives database (NRIS). To date only a limited amount of effectiveness data has been entered. It will take several years to begin to see any kind of a trend.

Table 3.15 Acres of Weeds not on Roads.

Allotment	Weed Species	Acres Infested
Bangtail Creek Allotment	Spotted Knapweed	2.4
Canyon Creek Allotment	Spotted Knapweed	0.4
Jackson Creek Allotment	Common Tansy	0.3
Jackson Creek Allotment	Houndstongue	0.1
Jackson Creek Allotment	Spotted Knapweed	7.1
Willow Creek Allotment	Canada Thistle	0.2
Willow Creek Allotment	Houndstongue	281.7
Willow Creek Allotment	Musk Thistle	126.4
Willow Creek Allotment	Spotted Knapweed	0.3
Willow Creek Allotment	Sulfur Cinquefoil	0.1
Total		419

Table 3.16. Roads and Weeds. This table summarizes the miles of roads within the Allotments on the National Forest. It assumes most roads have some weeds.

Allotment	Miles of Road Decommissioned	Miles of Open Road
Bangtail Creek Allotment	5.8	9.6
Canyon Creek Allotment	24.7	16.5
Jackson Creek Allotment	13.1	17.5
Stone Creek Allotment	1.0	3.7
Willow Creek Allotment	17.9	15.9
Total	62.5	63.2

Table 3.17. Logging and Weeds. This table summarizes the acres of logging on National Forest System Lands within the allotments.

Allotment	Acres
Bangtail Creek Allotment	577
Canyon Creek Allotment	2,280
Jackson Creek Allotment	1,089
Stone Creek Allotment	1
Willow Creek Allotment	1,263
Total	5,210

Some fire has been present on the landscape of the Bangtail Mountains since the Forest Service began keeping records in 1940. Records indicate that most wildfires have been suppressed and kept to less than an acre in size. Three larger fires greater than 10 acres in size occurred. Table 3.18 indicates the fire record extending back to 1940. One prescribed burn was implemented in 2004 and another is planned for 2009 or 2010 in the Grassy Mountain area on the Canyon Allotment. The objective of the prescribe fire is fuel reduction. Below is a table of prescribed burns and wildfires that have occurred in the Bangtail mountain range since 1940.

Table 3.18. Recent wild and prescribed fire in the Bangtail Mountains.

Type of fire	Year	Acres	Location	Number of fires/ burns
Prescribed	2004	99	Grouse Creek	1
Prescribed	Planned for 2009-2011	519	Grassy Mountain	2
Wildfire	1940-2007	Less than 1acre	Bangtails	30
Wildfire	1940-2007	1-10 acres	Bangtails	3
Wildfire	1940-2007	Greater than 10 acres	Bangtails	3

Some weeds are more of an ecological threat than are others depending on the area's environmental conditions and the weed's physiology. Like all plants, some species of weeds do better in certain environments than in others. In the case of weed species in this area, most have a wide range of environments in which they can either thrive or at least maintain a presence.

Spotted knapweed is minor weed in the bangtails and all known infestations are being treated. Common tansy is becoming more prevalent across the district and keeps showing up in new places each year. Canada thistle is so well established that it is treated only when it is convenient to do so or when it occurs in high use areas such as in campgrounds and around trailheads. Houndstongue does not seem to create large colonies of plants in this area but small groups of plants are found in many meadows and along roads and trails.

Tall larkspur is a native species poisonous to livestock. Spraying of this species is approved under the Noxious and Invasive Weed Treatment Project EIS and Record of Decision 2005. However, it is not targeted for spraying in this area.

As mentioned earlier in the discussion of the noxious weed issue, livestock are just one of many pathways contributing to weed establishment. Disturbed sites associated with forest management activities have the potential to allow weed establishment. Motorized equipment may transport weed seeds to these areas during logging or if these sites are not reclaimed weeds may establish after logging. Skid trails, log landings, road construction, contaminated gravel, removal or thinning of the forest canopy, and disturbance of native vegetation either by prescribed fire or from equipment can create areas for weed establishment. They can also allow existing populations to expand. Fire can increase soil nitrogen, decrease shade, and decrease competition from desirable plants all conditions that favor weed invasion. (Clark 2003).

A specific example of how livestock contribute to the dispersal of some weed species is with populations of hounds tongue. In late August and through September livestock are often covered with hundreds of hounds tongue seeds (Olsen 1999). These seeds are then transported around the allotment. Shady areas, riparian areas, and mineral licks are often hot spots for hound tongue establishment as livestock deliver seeds to these areas.

Belsky and Gelbard (2000) and Olsen (1999) document that along with direct transportation of seed on their coats, weeds seed can be transported on hooves, and in intestines. Also, livestock may

preferentially graze native plants over weeds thus favoring the non natives (Olsen 1999). Livestock also create disturbed soils that provide seed beds and disrupt microbiotic crusts that stabilize soils and inhibit weeds. Soil mycorrhizae important to many western plants can be reduced by livestock. Also, soil erosion from overgrazing can bury weed seeds and facilitate germination (Belsky and Gelbard 2000).

Roads are a main source of weed establishment and dispersal. It has also been shown that as roads are improved and use increases so does weed establishment and dispersal into adjacent areas (Forman et. al. 2003). There are a number of reasons for roads being sources of weed establishment. Roads are disturbed sites that offer a continual seedbed of soil free of other competing plants. Since weeds are often very competitive they are able to establish and thrive. Another reason is that noxious weed seeds are continually transported to road surfaces by way of many pathways mentioned above. Roads are also free of shade that might otherwise not allow weeds to grow (Forman et. al. 2003). Over 90 percent of weed infestations and hence treatment areas on the District are along roads (NRIS - TES Plants/Invasives Data Base 2008).

The environmental effects of treating noxious weeds using integrated weed management are documented in the 2005 Noxious and Invasive Weed Treatment Project EIS (Weed EIS) for the Gallatin National Forest. The Bangtail Allotment Management Plan Update incorporates the analysis guidance included in the Weed EIS and the associated Record of Decision (Weed ROD 2005).

A description of weed physiology can be reviewed in the Weed EIS Chapter 3.0. There is also extensive information on the internet related to noxious weed identification, prevention, and treatment.

The Forest follows and integrated weed management strategy. Integrated weed management as defined by Sheley et. al (1999) is the "..application of many kinds of technologies in a mutually supportive manner. It involves the deliberate selection, integration and implementation of effective weed control measures with due consideration of economic, ecological, and sociological consequences." Sheley et. al. go on to described the overall goal of integrated weed management as "…maintaining or developing healthy plant communities (restoration) that are relatively weed resistant, while meeting other land-use objectives such as forage production, wildlife habitat development, or recreational land maintenance" (Weed EIS 2005).

Integrated weed management in this area includes several strategies. Treatment of weeds on the District is typically done with herbicides applied by a licensed contractor or licensed Forest Service employees. Herbicides are often the most practical treatment for weeds and are usually the method of treatment on these allotments.

Strategies besides herbicides are used with mixed success. Using control methods such as hand pulling of weeds can be done on a limited basis and is not practical for all species. Canada thistle, yellow toadflax, leafy spurge, St John's wort, and oxeye daisy for instance can spread by their roots systems and are not practical to hand pull. Control methods such as the introduction of exotic insects that have been approved for release in this country is done in several areas of the District. Insects can work well if they are released in an environment that favors them but even then do not

completely eliminate weeds. Mechanical treatments such as mowing only works on some species. For example, spotted knapweed adjusts to mowing by continuing to grow and flower below the level of the mower.

The Bozeman Ranger District has an approved integrated weed management plan that provides a description of the District weed management program (Bozeman Ranger District Integrated Weed Management Plan 2004). The District weed plan describes overall conditions of weeds on the District along with cooperating agencies, programs and some funding opportunities to manage weeds.

Weed locations are tracked in several databases. The official US Forest Service records database for weeds is the TES Plants/Invasives Database that is part of the larger Natural Resource Information System (NRIS) data record keeping system. There are also district records used to periodically update the NRIS - TES Plants/Invasives Database. A Greater Yellowstone Ecosystem Weed Database is also updated annually. It is maintained by Fremont County Wyoming. This database is an effort supported by the Greater Yellowstone Coordinating Committee Weed Subcommittee which is made up of representatives of all the national forests, the national parks and many counties in the Greater Yellowstone Area.

Another consideration of noxious weed management is not only the environmental cost but also the economic cost. Noxious weeds have a large impact on the economy of the State and may cause job losses. While the exact economic impact of noxious weeds is not completely understood, it is estimated that the economic impact of leafy spurge in Montana, North Dakota, South Dakota, and Wyoming totals around $129.5 million each year and may result in the loss of 1,433 jobs. In Montana, spotted knapweed is estimated to cost $42 million each year. This could support around 500 jobs. It is estimated that allowing spotted knapweed to expand to its fullest range could cost Montana over $155 million a year. In this State alone, weeds cost farmers over $100 million each year in expenses and crop losses. Secondary impacts include degraded wildlife habitat which reduces wildlife-associated recreational expenditures. The secondary impact on the economy is not known but is probably between $200 and $300 million each year (Sheley, Olsen, Hoopes 2005).

The District's weed budget in 2008 was $20,000 dollars. Additional funds are available in some years from grants, other sources of funding, etc. Several areas of the District are competing for the limited weed suppression funding. For example, Gallatin Canyon is a higher priority for suppression because of the threat to wilderness, roadless, wildlife management areas, and the riparian ecosystem along the Gallatin River. The Bozeman Municipal Watershed (Hyalite and Bozeman Creeks) has a large hazardous fuel reduction project proposed. If approved this would require additional funds be spent to manage the weeds prior to, during and after project implementation. Receipts from the sale of forest products associated with this project would be used to help manage the weed problem in the area.

As it stands now, the District is not keeping up with the rate of weed expansion. Various strategies are being tried under integrated weed management to deal with the situation. The Forest Service is working cooperatively with several entities to manage the problem. Gallatin County is leading this effort. A large part of the problem in Gallatin County is the subdivision of farms and ranches into small parcels of land with many landowners. Not having landowners take care of their weeds

(either unknowingly or intentionally) is a large part of the problem facing Gallatin County and hence also the surrounding Gallatin National Forest. The solution is everyone's recognition and involvement in the weed problem.

Applicable Laws, Regulations, Policy and Forest Plan Direction Related to Weeds

1988 Natural Resource Agenda: In March of 1998, Forest Service Chief Mike Dombeck presented the Agency's emphasis in management direction for the 21st century. In this Agenda was a strong emphasis on conserving and restoring degraded ecosystems, including actions to "attain desirable plant communities", and "prevent exotic organisms from entering or spreading in the United States."

Forest Service Manual 2259.03: "Forest office shall cooperate fully with State, County and Federal officials in implementing 36 CFR 222.8 and sections 1 and 2 of PL 90-583 (see below). Within budgetary constraints, the Forest Service shall control to the extent practical, noxious farm weeds on all National Forest System lands."

Forest Service Manual 2080: In consultation with Federal, State, and local government entities and the public, develop and implement a program for noxious weed management on National Forest System lands. Activities implementing the noxious weed management program must be consistent with the goals and objectives identified in Forest Land and Resource Management Plans (FSM 1910, 1920, and 1930).

Executive Order 13112: Invasive Species, February 3, 1999. This order directs Federal Agencies whose actions may affect the status of invasive species to (l) prevent the introduction of invasive species (ii) detect and respond rapidly to, and control, populations of such species in a cost-effective and environmentally sound manner, as appropriations allow.

36 CFR Sub A, Sec 222.8: "… The chief, of the Forest Service, will cooperate with County or other local weed control Districts in analyzing noxious farm weed problems and developing control programs in areas which the National Forest and National Grasslands are a part."

Federal Noxious Weed Act of 1974 (sec 9): Authorized the Secretary to cooperate with other Federal and State agencies or political subdivisions thereof, and individuals in carrying out measures to eradicate, suppress, control or prevent the spread of noxious weeds. The Act provides for the control and management of nonindigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.

Carlson-Foley Act, October 17, 1968 (Public Law 90-583): Authorized and directs heads of Federal Departments and Agencies to permit control of noxious plants by State and local governments on a reimbursement basis in connection with similar and acceptable weed control programs being carried out on adjacent non-Federal land.

Federal Land Policy and Management Act of 1976 (Public Law 94-579): This act provides authority to control weeds on rangelands as part of a rangeland improvement program.

National Forest Management Act of 1976 (Public Law 94-588): This act provides authority for removal of deleterious plant growth and undergrowth and provides for expenditures of funds to serve as a catalyst to encourage better management of private forests and rangelands.

The State of Montana County Noxious Weed Management Act (MCA 7-22-2101): This act provides for designation of noxious weeds within the State and directs control efforts. Provisions are made for registration of pesticides, licensing of distributors and applicators, and enforcement of State statutes. An enforcement responsibility for the control of noxious weeds within Montana is delegated to County Commissioners through Weed Management District Boards. In Montana, the Montana County Noxious Weed Management Act states that it is unlawful for any person to allow noxious weeds to propagate or go to seed on their land unless they have an approved weed management plan. This act directs counties to develop weed control plans and implement weed control efforts.

Montana Weed Management Plan (2005): Strengthen, support, and coordinate private, county, state, and federal weed management efforts in the state, and promote implementation of ecologically-based integrated weed management programs.

Gallatin Forest Plan: Management direction for the Gallatin National Forest is found in the 1987 Gallatin National Forest Plan. The following summary highlights the management direction relevant to this proposal. Goals and standards found in the Forest Plan relevant to the proposed action include:

Manage National Forest resources to prevent or reduce serious long lasting hazards from pest organisms utilizing principles of integrated pest management (Gallatin Forest Plan, Forest-wide Goal, page II-1).

Noxious weeds along roads and trails will be treated (Gallatin Forest Plan, Forest-wide Standard, page II-27).

Implement an integrated weed control program in cooperation with the State of Montana and County Weed Boards to confine present infestations and prevent establishing new areas of noxious weeds. Noxious weeds are listed in the Montana Weed Law and designated by County Weed Boards. Integrated Pest Management, which uses chemical, biological, and mechanical methods, will be the principal control method. Spot herbicide treatment of identified weeds will be emphasized. Biological control methods will be considered as they become available. Funding for weed control on disturbed sites will be provided by the resource that causes the disturbance (Gallatin Forest Plan, Forest-wide Standard, page II-28).

3.5 Economics

Since the early 1900s, the federal government has required ranchers to pay a fee for grazing on federal lands. This arrangement has been the source of controversy related to many issues economics being one of them. Proponents of grazing contend that grazing is a productive use of these lands and supports local economic development. They also believe that the fee charged is fair, allows ranchers to stay in business, and provides stability in small rural communities.

Opponents argue that livestock damage public resources and they also argue that federal expenditures for grazing are too high and that fees charged too low, thereby contributing to increased grazing and the deterioration of rangelands. Reviews of the grazing fees and attempts to change them have a long history including suggestions of a buyout of federal grazing permittees (GAO 2005).

Grazing fees have been charged on the National Forest since 1906 and before 1906 livestock grazed free. Originally, operators were charged $0.05 per AUM for cattle but the fee increased to $0.56 per AUM by 1968. Forest Service grazing fees were originally calculated based on the rental value of local private grazing lands. Starting in the 1920s and continuing through 1968, the Forest Service based grazing fees on beef and lamb prices as determined through studies it conducted. In 1966, a survey was conducted for the western livestock industry called the *Western Livestock Grazing Surveys and Analysis*, and a 1968 review of the survey data determined that a fair market value for federal grazing permits and leases would be $1.23 per AUM. The $1.23 value was set to equalize the cost of conducting business between private ranch lands and federal lands. This rate is based on the premise that the costs of conducting grazing activities on federal lands should be competitive and comparable to the costs on private lands. At the time, the $1.23 per AUM grazing fee would have resulted in an increase of $0.72 per AUM for the Forest Service. Because this was a large increase, it was phased in over 10 years. Before it could be implemented, there were delays because of drought and debate over the increase. In 1976 Congress passed the Federal Land Policy and Management Act (FLPMA) which required the Secretary of Agriculture and of the Interior to conduct another study to establish a fee that was equitable to the United States and the grazing permittees. In 1977, the *Study of Fees for Grazing Livestock on Federal Lands* was completed (GAO 2005).

Based on a formula from the 1977 study Congress enacted a new grazing fee under the Public Rangelands Improvement Act (1978). The formula was implemented on a 7-year trial basis. After 7 years, the formula's effectiveness was evaluated and economists sought better ways to establish fees. However, the use of the 1977 formula was extended indefinitely by executive order (E.O. 12548) and has remained unchanged. Follow up studies in 1986 and 1992 identified technical issues with the formula such as the formula did not account for prices for calves produced on western lands, but did include cattle fattened on grain for slaughter that are not produced on western lands. The formula did not include a cost of living component, components of farm origin, or taxes, all of which increases the weight of factors affected by inflation, such as fuel costs. The reports identified the need to update the base value of $1.23 per AUM to reflect current market values rather than 1960s data (GAO 2005).

In 1993, another study was conducted in response to the perceived need to increase fees. It concluded competitive bidding as the only way to determine a fair market value for federal grazing permits. It also concluded that in lieu of competitive bidding all methods of estimating fair market value resulted in fees between $3 and $5 dollars and the base value of the formula should be negotiated at some price in that range. This study and report were used to inform efforts to reform grazing regulations in 1994. Then in 1997, federal legislation was introduced to change the grazing fees but was not enacted (GAO 2005).

The result is fees are set using a formula with the objective of achieving multiple sometimes conflicting objectives including: achieving a fair market value; recovering federal costs of the program; and treating ranchers, the public and other users of public lands equitably (GAO 2005). The grazing fees for 2009 have been set at $1.35 per AUM.

Numerous factors influence the overall economics of livestock grazing besides the grazing fee. Permittees and the Forest Service share the costs of livestock operations. The Forest Service, for example, provides materials for fencing and water developments and the permittee provides the labor and equipment. Cattle guards on roads are typically purchased and installed by the Forest Service. Permittees often conduct noxious weed suppression at either their expense or if they are licensed applicators. The Forest Service sometimes provides them herbicides for application on the allotment. The Forest Service provides a Rangeland Management Specialist to administer the permit and to work with the permittee on grazing strategies. The permittee is ultimately responsible for timing the removal of livestock with when utilization levels are going to be met. This requires they monitor utilization, dispense mineral supplements, move livestock to new pastures, and maintain water developments and fences. Most local operations are small enough that they are family run. Few actually have hired help. Livestock grazing directly and indirectly supports jobs in local communities.

Geographic and Temporal Extent of Affected Environment: The geographic extent considered in this analysis is the area within the allotment boundaries and general area around the city of Bozeman. The temporal extent of the affected environment includes those activities we foresee happening over the next ten years.

CHAPTER 4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Contents of Chapter

This Chapter discloses the direct, indirect and cumulative effects of the Alternatives described in Chapter 2. The affected environments related to each relevant issue were addressed in Chapter 3. Note that total acreage figures vary 100-200 acres between the various resource analyses conducted. Acres were calculated from computer generated mapping and minor variations in totals can be expected. Also the spatial extent that analyses were conducted on changed between resources so acreages differ.

4.2 Environmental Consequences by Issue and their Indicators

4.2.1 Issue: Livestock grazing could affect stream channel form and function and habitat for aquatic species.

4.2.1.1 Indicators for Stream Channel Form and Function Direct, Indirect and Cumulative Effects

Direct and Indirect Effects Indicators for Stream Channel Form and Function

- Response of bankfull width, particle size distribution, and residual pool depth
- Response of stream channels not functioning properly (i.e. functioning-at-risk, and non-functioning)
- Response of streams at greater than 20-point Stream Channel Stability departure (Pfankuch 1975)

Cumulative Effects Indicators for Stream Channel Form and Function:

- Miles of road
- Miles of road in stream management zones
- Number of road-stream crossings
- Logged areas
- Acres of primary rangelands grazed

This report addresses the potential effects of the proposed Bangtail Mountain Allotment Management Plan. Affected environment descriptions and environmental analyses are based on general reviews of the project area, site-specific field reviews, Proper Functioning Condition assessments, Stream Channel Stability assessments, stream channel classification surveys, and sediment modeling.

Methodology for Effects Analysis

Inventory: During the inventory phase for this analysis, two tools were used to assess the health of stream channels and associated riparian areas. These data were used to identify degraded stream segments and riparian systems.

a. Proper Functioning Condition (PFC) assessment (BLM 1998) – This is a methodology for assessing the physical functioning of a riparian-wetland area. It provides information critical to determining the "health" of a riparian-wetland ecosystem. Proper Functioning Condition considers both abiotic and biotic components as they relate to the physical functioning of riparian areas, but does not consider the biotic component as it relates to habitat requirements. The capability and potential of these riparian-wetland ecosystems is defined by the interaction of three components: 1) vegetation, 2) landform/soils, and, 3) hydrology.

b. Stream Channel Stability (SCS) procedure (Pfankuch 1975) – This is a method that evaluate both the inherent and current physical function and stability of stream channels regardless of stream channel type. The (Pfankuch 1975) procedure evaluates stream channel stability by rating four attributes along the upper banks (landform slope, mass wasting, debris jam potential), five attributes along the lower banks (channel capacity, bank rock content, obstructions/flow deflectors, sediment/traps, cutting, and deposition), and six attributes along the channel bottom (rock angularity, brightness, consolidation or bottom particles, percent stable, bottom materials, scouring and deposition, and amount of aquatic vegetation). This procedure focuses on the physical function of stream channel stability, not the quality of fish habitat. Generally, the most stable channels are steep and coarse textured riffles or cascades which do not provide much fish habitat. Conversely streams with numerous undercut banks, which provide good fish habitat, are rated lower in the channel stability rating procedure.

Management Objectives (Chapter 2.9): A three tiered management objective was established to maintain stream channels and associated riparian systems that are properly functioning and restore those that are not: 1) maintain all fully functioning stream channels and associated riparian systems; 2) establish a positive trend toward full restoration for those stream channels and associated riparian systems that are functioning-at-risk and non-functioning by year 2020; and, 3) bring all stream channels and associated riparian systems into proper functioning condition relative to their site potential by year 2030.

Management Actions: During the interdisciplinary team process, including discussion with livestock permittees, a variety of management actions were discussed and identified that would assist in the restoration of degraded stream channels. These actions were included as part of the proposed Alternative (Chapter 2.9, Alternative 3).

Monitoring: Permanent monitoring sites were established at three sites across the Bangtail Creek and Willow Creek allotments along stream reaches that are vulnerable to livestock grazing (Chapter 3.2). These three sites are located along degraded stream segments that were determined to be Functioning-at-Risk (FAR) or Non-Functioning (NF). Stream channel attributes that were measured along these permanently established monitoring reaches include bankfull width, bankfull depth, residual pool depth, particle size distribution, stream gradient, and sinuosity. Many of these attributes were also considered when conducting Proper Functioning Condition (PFC) and Stream Channel Stability (SCS). These attributes were selected because of lower observer variability, can be measured independent of stream flows, and are good indicators of other related stream channel

attributes such as pool habitat quality, bank stability, etc. Baseline data from these three monitoring sites are included in the project file and briefly discussed in Chapter 3.2 of this document. These attributes would be re-measured in three to five years then overlaid on baseline graphs to determine if the management objective for stream channel form and function is being achieved.

Feedback: If an undesirable shift in one of the above graphs or the lack of a desirable shift occurs, the Adaptive Management Implementation Team (AMIT) would review the data and make recommendations for management change. If a desirable shift or positive trend is documented, the AMIT would be notified and the positive trend would be documented in the range allotment files.

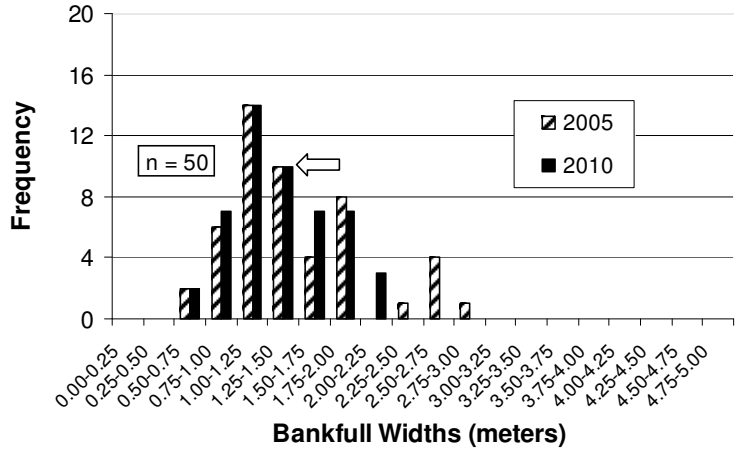
Effects Analysis

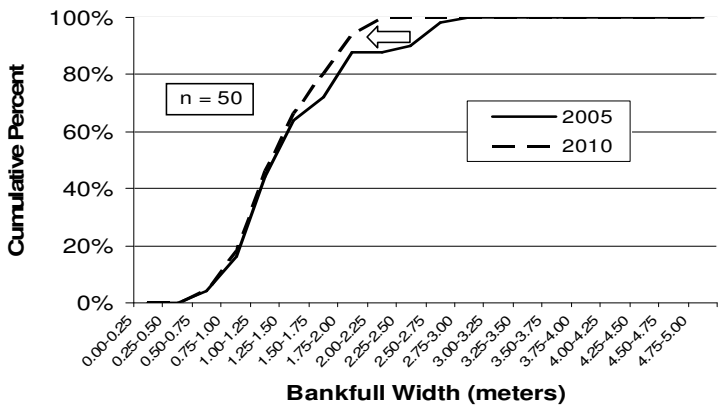
Stream channel data from the Proper Function Condition (PFC) and Stream Channel Stability assessments together with monitoring data would be used to describe anticipated direct, indirect and cumulative effects to stream channel form and function. These anticipated effects are described for each alternative below. The following effects analysis characterizes the direction, rate, and duration of the effects.

Alternative 1 (No Grazing)
If the No Grazing Alternative is selected, no livestock grazing would occur on the National Forest portion of the allotments. All interior fences and water developments would be removed.

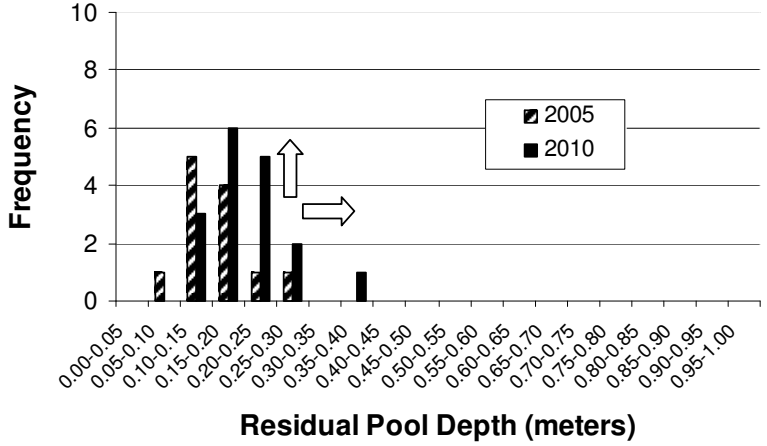
Direct effects are defined as those effects that occur at the same time and place as the triggering action. For stream channel form and function, it is those actions that result in immediate changes to stream channel morphology such as landslides, debris torrents, catastrophic floods, etc. Indirect effects occur later in time and distance from the triggering action. For stream channel form and function, indirect effects are from those actions that affect the bankfull width, bankfull depth, stream channel gradient, sinuosity, and substrate. Because changes to stream channels from livestock take several decades to manifest, all grazing related effects would be indirect in nature.

Thirteen sites or stream segments across the five allotments were determined to either be functioning-at-risk, non-functioning or having a 20-point or greater departure for the Stream Channel Stability rating (table 3.1). From this time forward, the sites or stream segments are referred to as degraded. Degraded stream segments that are entirely related to livestock grazing would recover to their site potential. Positive trends for bankfull width, residual pool depth, and particle size distribution similar to what is displayed in figure 4.1 would be expected. Degraded stream segments that are partially related to livestock grazing would probably not fully recover to their site potential unless other contributing factors are addressed such as roads, etc. There were no degraded stream segments that were thought to be not related to livestock grazing. Stream channels in proper functioning condition would be expected to remain stable unless other contributing factors begin to degrade these stream channels. The recovery under Alternative 1 (No Grazing) would be faster as compared to Alternatives 2 and 3. Recovery of stream channels would continue indefinitely unless other contributing factors result in degradation to these stream channels.

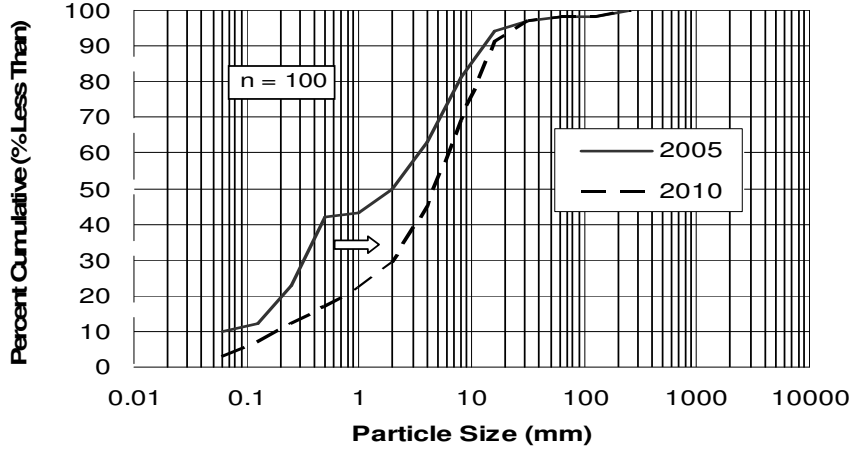




Bankfull Width Frequency and Cumulative Bankfull Width – Along functioning-at-risk and non-functioning stream reaches, bankfull widths increase as a result of streambanks being sheared by livestock. A positive trend is indicated by a leftward shift as displayed above.



Residual Pool Depth - Along functioning-at-risk and non-functioning stream reaches, pools get shallower as channels become overwidened and/or filled with fine sediment. A positive trend would be a rightward and/or upward shift as displayed.



Particle Size Distribution - Along functioning-at-risk and non-functioning stream reaches, the Particle Size Distribution can be skewed towards smaller sized substrate from erosion. As channels stabilize and narrow transporting fine sediment improves causing a rightward shift in the Particle Size Distribution displayed above

Figure 4.1. Graphs displaying a positive trend or desirable shift in bankfull width, residual pool depth and particle size distribution between 2008 and when the established monitoring reaches are re-measured in three to five years.

Alternative 2 (No Action)
The five allotments being analyzed would be grazed similarly to the way these allotments are today with the same grazing standards, Animal Unit Months (AUM's), livestock class, fences and water developments.

Because 1.3 miles of the North Fork, Middle Fork, and South Fork of Willow creeks are functioning-at-risk, the Forest Service and livestock permittee informally agreed to implement the annual bank alteration portion of the Beaverhead-Deerlodge Riparian Guidelines several years back. As described in the Affected Environment section of this document, several of the functioning-at-risk reaches along North Fork are in an upward tend most likely in response to the implementation of these guidelines. Because these guidelines have not been formalized in the Allotment Management Plan (AMP), it can not be assumed that these guidelines would be followed if Alternative 2 is selected.

Direct and Indirect Effects: Thirteen stream segments across the five allotments were determined to be degraded (table 3.5). Five of these degraded stream segments are presently exhibiting an upward trend. All five of these degraded stream segments are located along the North Fork Willow Creek (4) or Middle Fork Willow Creek (1) where annual bank alteration guidelines were informally implemented. Because these bank alteration guidelines are informal, it can not be assumed that these improvements will continue. Of the 13 degraded stream segments, none would be expected to achieve proper functioning condition or exhibit a positive trend for bankfull width, residual pool depth and particle size distribution as displayed in figure 4.1. If any recovery did occur, the rate of recovery would be much slower as compared to the other two Alternatives.

Alternative 3 (Proposed Action)
Under Alternative 3, the Canyon Creek and Stone Creek allotments would be managed similarly to Alternative 2. The important differences include formal streambank trampling standards and long-term monitoring on specific stream reaches.

Under Alternative 3, the following management actions are proposed for the remaining allotments to address the degraded stream segments (figure 2.4 and Appendix 1- Map 3):

a. Bangtail Creek Allotment – An annual stream bank alteration standard of 20 percent would be formalized in the Allotment Management Plan (AMP) for all functioning-at-risk stream reaches along Bangtail Creek. A new water development would be constructed near a spring located near the ridge in an attempt to pull the cows away from Bangtail Creek. Monitoring data would be re-measured every three to five years along two previously selected stream reaches described in the Affected Environment (Chapter 3.2) section to determined progress at meeting interim and final stream channel form and function objectives.
b. Willow Creek Allotment - An annual stream bank alteration standard of 20 percent would be formalized in the AMP for the North, Middle, and South Forks of Willow Creek. Monitoring data would be re-measured every three to five years along a previously selected stream reach described in the Affected Environment section to determined progress at meeting interim and final stream channel form and function objectives. Two small parcels

of National Forest within the middle fork drainage currently being grazed in conjunction with private land would be put under permit and grazed similarly to the rest of the allotment. Cattle would be excluded from a quarter mile reach of National Forest along the Middle Fork Willow Creek using a temporary electric fence or permanent fence.

c. Jackson Creek Allotment - An annual stream bank alteration standard of 20 percent would be formalized in the AMP for all functioning-at-risk and non-functioning stream reaches along Fleshman Creek. The cattle trough located along the headwaters of Fleshman Creek would be removed from its current site and moved to a more suitable location.

Direct and Indirect Effects: Canyon Creek and Stone Creek allotments have minor management changes proposed. No stream segments were identified as functioning-at-risk, non-functioning or having greater than a 20-point Stream Channel Stability departure (table 3.5). Stream channel parameters within these allotments are expected to remain in their current condition.

Bangtail Creek, Willow Creek, and Jackson Creek allotments include important management changes on 13 degraded stream segments (table 3.5). All 13 degraded stream segments that were thought to be entirely related (six) or partially related (seven) to livestock grazing. These sites would be expected to recover or begin recovering from the proposed management actions and exhibit a positive trend for bankfull width, residual pool depth and particle size distribution as displayed in figure 4.1. For those degraded stream segments that are partially related to livestock grazing, the extent of the recovery would depend on the relative amount of other contributing factors. All degraded stream segments located within the Willow Creek sub-watershed that have been informally managed with bank alteration standard for the last few years were determined to be in an upward trend. It is believe that this trend would continue under Alternative 3 after the proposed stream bank alteration standard has been formalized in the AMP. The 303(d) listed segment of Jackson Creek Allotment has no existing discernable impact from cattle grazing with no change in channel stability. Alternative 3 poses little change to channel stability or water quality since existing grazing impacts to this allotment are small and would not be expected to change under Alternative 3.

If positive trends for stream channel form and function attributes such as bankfull width, residual pool depth and particle size distribution are not observed through future monitoring, new management actions or fallback management actions would be agreed upon by the Adaptive Management Implementation Team (AMIT) and implemented through the feedback process. Proposed management actions, along with fallback management actions, would be expected to result in full recovery of those six degraded stream segments that are entirely related to livestock grazing. It is expected that a positive trend toward recovery, if not full recovery, would be observed along the seven degraded stream segments that are partially related to livestock. The rate of recovery would be slower under Alternative 3 as compared to Alternative 1, but faster than Alternative 2 as a result of more intensive grazing management.

Cumulative Effects

Spatial Boundary: The analysis area was designed to include the downstream extent of where management actions directly or indirectly affect stream channel form and function (figure 4.2). Livestock grazing related effects to stream channel form and function are localized within the five

allotments and do not extend beyond the allotment boundaries, with the exception of sediment which is transported downstream to larger streams and rivers. For example, it is proposed under Alternative 3 that a stream bank alteration standard be incorporated along 3.2 miles of perennial stream which represents 4.5 percent of all known perennial stream miles within the five allotments. It is being assumed that if these localized areas of livestock grazing related impacts are properly managed, that stream channel form and function would recover resulting in subsequent improvements to downstream sediment levels. The spatial boundary for the analysis area is broken into six distinct analysis areas corresponding to sub-watershed or 6th field HUC boundaries: Upper Brackett Creek, Canyon Creek, Bangtail Creek, Willow Creek, Fleshman Creek, and Jackson Creek (Appendix 1 – Map 4). These distinct analysis areas are truncated at the Forest boundary or allotment boundary which ever is located further downstream. Upstream parcels of private land (inholdings) are included within these analysis areas. Livestock related grazing effects and cumulative effects were not analyzed in the remaining two sub-watersheds (Billman, Upper Bridger Creek) for reasons listed in the Aquatics and Watershed Section of Chapter 3.

Temporal Boundary: Localized degraded stream segments as described in Aquatics and Watershed Section of Chapter 3 occurred as a result of decades of livestock grazing and other contributing activities such as logging and road construction. Livestock grazing and low-tech timber harvest most likely occurred on portions of the landscape prior to the creation of the Gallatin National Forest. The initiation of industrial commercial timber harvest and associated road building most likely started in these analysis areas following World War II. Impacts from these and other contributing activities can still be observed and negatively affect stream channel form and function within these six analysis areas.

Cumulative Effects Alternative 1

Recovery of the degraded stream segments would require several years even under Alternative 1 (No Grazing). The later temporal bound coincides with the proposed management objective of obtaining full restoration of all non-functioning and functioning-at-risk stream reaches to their site potential by the year 2030.

Table 4.1. Steams and Water Quality. Indicators used to assess cumulative effects from past, recent projects, proposed and foreseeable actions within the six analysis areas for Alternatives 1, 2 and 3.

	Indicator	**Past** (1950-2009)	**Recent Projects**	**Proposed**	**Future** (2010-2030)	**Cumulative** (Total)
Upper Brackett Creek HUC						
Alternative 1	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternative 2	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternative 3	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternatives 1, 2 and 3	Primary Rangeland Grazed (acres)	1,347	0	-1,347	0	0
	Timber Harvest (acres)	2,108	0	0	0	2,108
	Roads (miles)	31.5	-14.1	0	0	17.4
	Road Stream Crossings (#)	27	-8	0	0	19
	Roads in Stream Influence Zones (SIZ) (miles)	3.2	0.9	0	0	2.3

	Indicator	Past (1950-2009)	Recent Projects	Proposed	Future (2010-2030)	Cumulative (Total)
Canyon Creek HUC						
Alternative 1	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternative 2	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternative 3	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternatives 1, 2 and 3	Primary Rangeland Grazed (acres)	1,310	0	-1,310	0	0
	Timber Harvest (acres)	1,668	0	0	0	1,668
	Roads (miles)	29.9	-10.8	0	0	19.1
	Road Stream Crossings (#)	18	-2	0	0	16
	Roads in Stream Influence Zones (SIZ) (miles)	1.3	-0.3	0	0	1.0
Bangtail Creek HUC						
Alternative 1	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	3	0	0	-3	0
Alternative 2	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	3	0	0	0	3
Alternative 3	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	3	0	-3	0	0
Alternatives 1, 2 and 3	Primary Rangeland Grazed (acres)	2,211	0	-2,211	0	0
	Timber Harvest (acres)	596	0	0	0	596
	Roads (miles)	19.6	-5.8	0	0	13.8
	Road Stream Crossings (#)	10	-1	0	0	9
	Roads in Stream Influence Zones (SIZ) (miles)	0.6	0	0	0	0.6
Willow Creek HUC						
Alternative 1	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	8	0	0	-8	0
Alternative 2	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	8	0	0	0	8
Alternative 3	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	8	0	-8	0	0
Alternatives 1, 2 and 3	Primary Rangeland Grazed (acres)	1,450	0	-1,450	0	0
	Timber Harvest (acres)	1,267	0	0	0	1,267
	Roads (miles)	34.4	-17.9	0	0	16.5
	Road Stream Crossings (#)	21	-11	0	0	10
	Roads in Stream Influence Zones (SIZ) (miles)	2.6	-1.5	0	0	1.1
Fleshman Creek HUC						
Alternative 1	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	2	0	0	-2	0
Alternative 2	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	2	0	0	0	2

	Indicator	Past (1950-2009)	Recent Projects	Proposed	Future (2010-2030)	Cumulative (Total)
Alternative 3	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	2	0	-2	0	0
Alternatives 1, 2 and 3	Primary Rangeland Grazed (acres)	510	0	-510	0	0
	Timber Harvest (acres)	386	0	0	0	386
	Roads (miles)	6.0	-3.1	0	0	2.9
	Road Stream Crossings (#)	2	-0.0	0	0	2
	Roads in Stream Influence Zones (SIZ) (miles)	0.2	-0.1	0	0	0.1
Jackson Creek HUC						
Alternative 1	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternative 2	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternative 3	Sites Not in PFC or > 20 Point Stream Channel Stability (SCS) Departure (#) /[a]	0	0	0	0	0
Alternatives 1, 2 and 3	Primary Rangeland Grazed (acres)	912	0	-912	0	0
	Timber Harvest (acres)	2,819	0	0	0	2,819
	Roads (miles)	31.4	0	0	0	31.4
	Road Stream Crossings (#)	31	-4	0	0	27
	Roads in Stream Influence Zones (SIZ) (miles)	3.5	0	0	0	3.5

/[a] = all degraded stream segments are located within the National Forest portion of each analysis area.
/[b] = these figures may decrease slightly if livestock exclosures are constructed.

Under Alternative 1 (No Grazing), livestock grazing on primary grazing lands on National Forest system lands would be reduced 100 percent or 6,561 acres of primary rangelands (table 4.1). There are no other allotments within the six analysis areas that would continue to be grazed. All 13 of the degraded stream segments would be expected to fully or partially recover. When degradation is partially a result of livestock grazing, the extent of recovery is dependent on other contributing factors.

All past timber harvest activities occurred prior to the Big Sky Lumber Land Exchange in the late-1990's. These acres are thought to be fully recovered hydrology, thereby no longer resulting in increase sediment delivery to streams. During the last three years, Gallatin National Forest has been implementing the Bangtail Road Decommissioning and Trail Obliteration Project (May 24, 2006 decision). Cumulative total Road Miles, Road Miles within Stream Management Zones (SMZs), and Road Stream Crossings data displayed in table 4.1 reflect the current condition after the recent road decommissioning and trail obliteration project was completed. Additional touch up work and/or maintenance work is expected on these roads and trails, but no new roads or trails are expected to decommissioned or obliterated. No new roads or timber harvest are anticipated in the near future (five years) within the six analysis areas. Non-livestock related cumulative effects would remain the same for all three Alternatives.

Summary Conclusion Alternative 1

Under Alternative 1 (no grazing), no livestock grazing would occur on the National Forest portion of the six analysis areas. All interior fences and water developments associated with these allotments would be removed. Alternative 1 (no grazing) is consistent with laws, regulation, policy,

and Gallatin Forest Plan direction as related to stream form and function. The streambank degradation resulting from livestock impacts on National Forest System lands would largely recover since grazing would not occur.

The 303(d) listed segment of Jackson Creek allotment has no existing discernable impact from cattle grazing with no change in channel stability. Alternative 1 would have little change to channel stability or water quality since existing grazing related impacts to the National Forest portion of this allotment are small.

Water quality in all streams located within the Bangtail allotments are designated as B-1 by the Montana DEQ (2003a) in ARM 16.20.604. The associated beneficial uses of B-1 water are drinking, culinary and food processing purposes, bathing, swimming, and recreation, growth and propagation of salmonid fishes and associated aquatic life, waterfowl, furbearers, and other wildlife; and agricultural and industrial water supply (ARM 17.30.607 & 623).

Applicable standards for Montana's B-1 streams and rivers include maximum allowable increase in naturally occurring turbidity is 5 nephelometric turbidity units (NTU); and no increases are allowed above naturally occurring concentrations of sediment, settleable solids, oil, or floating solids, which would or are likely to create a nuisance or render the water harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife (ARM 17.30.623). Montana water quality standards are met in Alternative 1.

The Forest plan (MA7) requires the GNF to "manage riparian vegetation, including overstory tree cover, to maintain streambank stability and promote filtering of overland flows". The Forest plan monitoring requirements (Forest Plan Table IV-1) monitoring item 5 lists two guidelines and standards which relate to limits of cumulative allowable management caused change to sediment filtration i.e. "more than a 25 % loss in effective streambank cover" and stream channel stability i.e. a "20 point increase in stream channel score within 5 years due to management practices". These Gallatin Forest Plan direction monitoring requirements would be met for all stream segments in Alternative 1.

Alternatives 1 (No Action) is consistent with the State of Montana Water Quality Act as well as other applicable laws policies, and the Gallatin Forest Plan (USDA 1987) since livestock grazing on the grazing allotments would be discontinued. TMDL (303)d coordination is described in the Affected Environment section. Specific Montana water quality standards that would be met include Administrative Rules of Montana 17.30.623 (1), which requires that B-1 waters after conventional treatment are suitable for growth and propagation of salmonid fishes and associated aquatic life and 17.30.623 (2) (f) that does not allow increases above naturally-occurring concentrations of sediment that would render the waters harmful to public health, recreation, safety, livestock, fish or other wildlife.

Cumulative Effects Alternative2

Under Alternative 2 (No Action), livestock grazing would continue to be allowed on all 6,561 acres of primary rangeland on National Forest system lands within the six analysis areas. All 13 of the degraded stream segments would remain in their existing degraded condition. Non-livestock related cumulative effects would remain the same as those described under Alternative 1 (table 4.1).

Summary Conclusion Alternative 2

Under Alternative 2 (No Action), the five allotments would be grazed similarly to the way these allotments are today with the same grazing standards, Animal Unit Months (AUM's), livestock class, fences and water developments. Alternative 2 (No Action) would not meet all laws, regulations, and policies listed in the Affected Environment section as related to stream channel form and function on the Bangtail Creek, Willow Creek, and the Fleshman Creek portion of the Jackson Creek allotment. Alternative 2 (No Action) would meet these laws, regulations, and policies on the Canyon Creek and Stone Creek allotments, as well as the Jackson Creek portion of the Jackson Creek allotment.

The 303(d) listed segment of Jackson Creek allotment has no existing discernable impact from cattle grazing with no change in channel stability. Alternative 2 poses little change to channel stability or water quality since existing grazing impacts to this allotment are small and would not be expected to change under Alternative 2.

Alternative 2 (No Action) is only marginally consistent with the State of Montana Water Quality Act as well as other applicable laws policies, and the Gallatin Forest Plan (USDA 1987). TMDL (303)d coordination is described in the Affected Environment section. Best Management Practices would be employed.

Cumulative Effects Alternative3

Under Alternative 3, livestock grazing would continue to be allowed on all 6,561 acres of primary rangeland on National Forest system lands within the six analysis areas.
All 13 degraded stream segments would be expected to fully or partially recover. Non-livestock related cumulative effects would remain the same as those described under Alternative 1 (table 4.1).

Summary Conclusion Alternative 3: Under Alternative 3, all 13 degraded stream segments that are thought to be entirely related (six) or partially related (seven) to livestock grazing are expected to recover or begin recovering from the proposed or fallback management actions and exhibit a positive trend for bankfull width, residual pool depth and particle size distribution as displayed in figure 4.1 Alternative 3 would meet all laws, regulation, and policy described in the Affected Environment section in this document.

Montana water quality standards would be met under Alternative 3. Alternative 3 is consistent with the State of Montana Water Quality Act as well as other applicable laws policies, and the Gallatin Forest Plan (USDA 1987). Sediment and TMDL compliance is described in the Affected Environment section. Specific Montana water quality standards that would be met include Administrative Rules of Montana 17.30.623 (1), which requires that B1 waters after conventional treatment are suitable for growth and propagation of salmonid fishes and associated aquatic life and 17.30.623 (2) (f) that does not allow increases above naturally-occurring concentrations of sediment that would render the waters harmful to public health, recreation, safety, livestock, fish or other wildlife.

Summary Conclusions Alternative 3
Under Alternative 3 (Proposed Action), it is expected the 100 percent of the degraded stream segments within the six analysis areas would recover or begin recovering. The rate of expected recovery would be intermediate to Alternatives 1 and 2.

Table 4.2. Summary of livestock grazing cumulative effects indicators within the watershed analysis areas.

Issue:	Alternative	Percent Reduction in Primary Grazing Acres	Recovery of Degraded Sites or Stream Segments			
			Sites Expected to Recover	Total Sites	Percent Recovery	Rate of Recovery
Livestock grazing could affect stream channel form and function.	1	100%	13	13	100%	Fastest
	2	0%	0	13	0%	Slowest
	3	0%	13	13	100%	Intermediate

Monitoring and Monitoring Requirements:

Planned monitoring for the issue of stream channel form and function are included above in the Methodology for Effects Analysis section.

4.2.2 Issue: Livestock grazing could affect management indicator species, and the overall diversity of animal life.

4.2.2.1 Indicators for Direct, Indirect and Cumulative Effects on Management Indicator Species (MIS) and the Overall Diversity of Animal Life

- Goshawks – effects on foraging
- Elk – effects on forage availability and distribution, reproductive, and security habitat
- Impacts on migratory bird nesting and foraging
- Predators
- Biodiversity

Effects Analysis

Spatial Analysis Area for Direct and Indirect Effects: The project area considered for direct and indirect effects includes the combined area of all lands managed as part of the allotments (20,654 acres) in the Bangtail Mountain Range.

Spatial Analysis Boundary for All Cumulative Effects: Extreme individual variation in home range size is reported in the literature for management indicator species. The entire Bangtail Range (approximately 38,000 acres) was used for cumulative effects analysis. This spatial scale was used based on the following factors: The Bangtail Range is a relatively small, isolated mountain range,

but is large enough to contain home range sizes for all MIS considered in this report. The mountain range contains seasonal or year round habitat for MIS, and contains all potential management actions considered under this proposal.

Temporal Boundary for All Cumulative Effects: Factors that have influenced habitat conditions in the Bangtails, including livestock grazing, have occurred over a period of many decades. Therefore the past timeframe evaluated for cumulative effects considers a period going back to the early 1900s to cover the period of livestock use in the area. This period allows assessment of past management actions and natural events that have shaped landscape patterns in the Bangtail Range. A timeframe of approximately ten years out past the implementation date was considered for reasonably foreseeable future actions. This time period covers the estimated life of the NEPA decision document for livestock grazing in the Bangtails.

Methodology for Northern Goshawk Analysis

Northern goshawk surveys were conducted in 2003 for prescribed burns proposed within the project area and no goshawks were detected through these surveys. District records and pertinent literature were reviewed for insight on goshawk habitat relationships, availability and distribution within the project area.

Direct and Indirect Effects - Goshawk

Alternative 1 (No Grazing)
Alternative 1 would remove domestic livestock structures such as fences and water developments from the National Forest lands in the Bangtail Range. Currently, livestock impacts to wildlife habitat in the Bangtail allotments are most notable in riparian and shrub communities. Livestock grazing in the project area has had only minor effects in upland areas, primarily associated with noxious weed spread and conversion from native plant species to non-native species in some areas. Livestock presence has had little or no effect in forested habitat, with any notable effects located at forest edges where cattle seek shade under forest canopies. Under this alternative, riparian vegetative communities would begin to recover from grazing, browsing and trampling associated with livestock grazing, but some impacts would continue due to use by wild ungulates. Upland areas would remain largely the same as the existing condition, because wild ungulate use would continue. Planned treatment of invasive plant species would move plants toward native community types. Some invasive plants would never be completely eradicated.

Livestock grazing can remove materials that provide important cover for small mammals and ground-nesting birds, and livestock presence can result in direct mortality of young if nests are trampled. Since goshawks feed on birds and small mammals, removing livestock could be slightly beneficial for goshawk foraging opportunities. Prey species are not limited in the project area, so any benefits gained through the removal of livestock would be negligible at the population level for goshawks.

Alternative 2 (No Action)
The No Action alternative would leave livestock grazing management as it exists today, with no additional procedures adopted to facilitate an adaptive management approach. Under this

alternative, grazing operations would remain at 'status quo', with continued impacts to wildlife habitat. Degradation of riparian habitat would be expected to continue in existing problem areas, and could potentially spread to other riparian areas. Alternative 2 would retain the existing grazing systems on the livestock allotments in the Bangtails. Upland and riparian utilization standards would also remain the same under this alternative. Upland standards are generally being met under the existing systems, although there may be overuse in some areas in some years (e.g. during drought), but these conditions are typically offset by under use in other areas. Noxious weed infestations would likely be more troublesome since livestock remain as a vector for weed transfer and establishment.

Northern goshawks nest in dense, mature forest types, so continuing existing livestock grazing practices would not affect goshawk nesting habitat. However, goshawks use a variety of habitats for hunting, including open meadows, open forest types, riparian areas and the ecotones between forest and non-forested areas. Livestock grazing can remove materials that provide important cover for small mammals and ground-nesting birds, and livestock presence can result in direct mortality of young if nests are trampled. Since goshawks feed on birds and small mammals, continued grazing practices may have some negative effects on goshawk prey species. Conversely, reduced concealment cover of prey species could actually improve hunting conditions for goshawks.

Alternative 3 (Adaptive Management)
Alternative 3 would incorporate adaptive management practices designed to improve resource conditions while still permitting livestock use on the National Forest. This alternative would emphasize improved stream form and function and riparian health. Alternative 3 would also emphasize better distribution of livestock, which would result in improved upland and riparian conditions. Grazing systems would not change immediately under Alternative 3, but could possibly change in the future under the adaptive management approach. Changing grazing systems could be used over time to address resource management issues if monitoring indicates a problem. Alternative 3 does not propose additional fencing for pasture alignment, but a small amount (appx. ¼ mile total) of fence would be constructed as a riparian area exclosure in North Willow Creek. Alternative 3 includes the development of seven additional water improvements to improve livestock distribution and forage utilization levels.

Alternative 3 would have no effect on goshawk nesting habitat, but could improve foraging conditions by enhancing riparian habitat and upland meadow habitat for prey species. Although this alternative has potential to improve foraging habitat, specific treatment measures would not be designed with goshawks or their prey species in mind.

Cumulative Effects

Cumulative Effects of Alternatives 1, 2, and 3- Goshawk
Riparian areas provide important habitat for northern goshawks. In addition to impacts from livestock use, riparian habitat has been disproportionately affected by residential development, agriculture, recreation, and proximity to roads. Roads and trails built to facilitate these uses are often located in riparian influence areas. Upland areas have also been influenced by activities in addition to livestock grazing over time. Native vegetation structure and composition has been influenced by past, and to a lesser degree, recent livestock management practices. Other land use

activities such as timber harvest, road and trail use, dispersed recreation, and local subdivisions have contributed to the spread of noxious weeds. Traditionally, prescribed burning, chemical treatment and mechanical methods have been used to remove shrub species such as sagebrush in favor of forage species for livestock in the west. Saab et al. (1995) reported that heavy use by livestock could reduce the amount of fine fuels required to carry fire, potentially altering fire frequency. Land use and management practices that alter fire behavior have influenced forested habitats in the Bangtail Range. The Gallatin Land Consolidation Act changed land ownership patterns in the Bangtail Range such that the bulk of National Forest System lands are now located on the east side of the Range, while the west side is now almost entirely privately owned. This new land ownership configuration has resulted in changed recreation and resource use patterns, as well as altered the rate and potential for housing development. Such changes could have notable impacts on wildlife distribution and use patterns.

Riparian and shrub habitats can provide foraging opportunities for goshawks. Frequent, low-intensity burns play a natural role in maintaining the open understory preferred by goshawks for nesting habitat. Human uses that have altered natural fire patterns may have influenced the amount and distribution of suitable goshawk nesting habitat over time in the Bangtail Range. Goshawk habitat occurs on both public and private lands in the Bangtails. Different land use patterns and potential increased housing development on consolidated private lands on the west side of the range could reduce the amount of suitable nesting and foraging habitat for goshawks in the Bangtail Range.

Alternative 1 (No Grazing) presents conditions under which cumulative effects may result from economic factors that lead private landowners to change land use from livestock grazing to housing or other development. If livestock grazing were eliminated from National Forest System lands in the Bangtails, then permittees who currently use their own private land as part of their livestock grazing areas, could find that it is no longer economically feasible to manage their private land for livestock use. As a result, some private land may be sold and/or developed for other purposes such as residential housing. Permanent alterations on private land (such as housing development) result in habitat loss for wildlife, and can affect wildlife habitat use and distribution patterns across the landscape.

Alternative 1 would remove direct effects associated with habitat alteration due to livestock use on the National Forest but could have adverse impacts associated with cumulative effects if it results in permanent habitat loss on private lands. Alternative 2 would maintain the status quo for livestock grazing operations, under which management indicator species populations have ebbed and flowed, but overall have remained at sustainable levels. Alternative 3 would adopt a collection of management tools that could be implemented to alleviate livestock impacts to MIS, but would also help sustain the economic viability of the local ranching community, which could have implications for the long term conservation of MIS habitat on private ranch lands.

Summary Conclusions Alternative 1, 2, and 3

All alternatives would be consistent with applicable laws, regulations, policy and direction for MIS habitat management. Livestock operations have for the most part been compatible with MIS management goals in the Bangtails. Alternative 3 (Adaptive Management) has merit for improving livestock use and distribution to facilitate better habitat management for MIS.

Methodology for Elk Analysis

Field site visits were made to the project area in 2007-2008 to collect data and evaluate existing conditions. During these visits, presence of big game species was recorded based on sightings, scat and track detections. Evidence of herbivory was noted, as was obvious use of key habitat components such as wet areas. Montana Fish Wildlife and Parks personnel were contacted for population trend information for elk. Elk populations are currently above state population objectives for herds using the Bangtail Range (T. Lemke, pers. comm. 2009). A literature search was conducted to obtain information regarding MIS habitat relationships, and potential impacts from livestock grazing activities.

Direct and Indirect Effects - Elk

Alternative 1 (No Grazing)
Elk, deer and moose may all use riparian habitat for cover, forage, and as travel routes. Improved riparian conditions resulting from removal of livestock are not expected to result in significant increases in big game populations in the Bangtails, but would help maintain healthy herds. Noxious weed conditions are expected to improve as livestock are removed as a weed establishment vector. Upland vegetation would move toward native plant communities. However, without livestock utilization, non-native species such as timothy, which is relatively unpalatable to big game, would continue to spread and reduce the availability of native forage species for wild ungulates. Removal of fencing associated with livestock allotments would benefit big game by reducing energy costs associated with negotiating the obstacles or barriers to travel presented by fencing structures. Approximately 9.7 miles of fence would be removed from National Forest lands under Alternative 1.

Alternative 2 (No Action)
Continued livestock use in riparian areas could result in decreased cover, reduced availability of browse species, and conversion to less palatable shrub species for big game. Approximately 9.7 miles of fence would be maintained for livestock management purposes under Alternative 2. Fencing used to confine cattle within pastures and/or allotments may pose obstacles to big game movement, and can influence overall big game distribution patterns. This factor would have the most impact during winter and spring months when animals are at a low point of their energy budget and jumping or traversing fences places undue demands on limited energy reserves. Fences may also cause injury to big game due to collisions when animals flee from predators or other disturbances.

Alternative 3 (Adaptive Management)
Improved riparian vegetative conditions would be beneficial to big game species, particularly moose. Better management of livestock distribution would improve overall forage conditions for big game.

Cumulative Effects - Elk

Alternatives 1, 2 and 3
Changes in private lands use resulting from losses in Federal grazing permits are a potential problem with Alternative 1. Sales of ranches for subdivisions are a common practice locally because of high land values. If livestock grazing were eliminated from the National Forest in the Bangtails, then permittees who currently use their own private land as part of their livestock grazing areas, could find that it is no longer economically feasible to manage their private land for livestock use. As a result, some private land may be sold and/or developed. Subdivisions result in permanent habitat loss for wildlife, and can affect wildlife habitat use and distribution patterns across the landscape. Loss of forage on the National Forest may also result in ranchers having to buy hay or graze their lands more intensively.

Alternative 1 would remove direct effects associated with habitat alteration due to livestock use on the National Forest but could have adverse impacts associated with cumulative effects if it results in permanent habitat loss on private lands. Alternative 2 would maintain the status quo for livestock grazing operations, under which MIS populations have ebbed and flowed, but overall have remained at sustainable levels. Alternative 3 would adopt a collection of management tools that could be implemented to alleviate livestock impacts to MIS, but would also help sustain the economic viability of the local ranching community, which could have implications for the long term conservation of MIS habitat on private ranch lands.

Summary Conclusions for Alternatives 1, 2, and 3
All alternatives would be consistent with applicable laws, regulations, policy and direction for MIS habitat management. Livestock operations have for the most part been compatible with elk management goals in the Bangtails. Alternative 3 (Adaptive Management) has merit for improving livestock use and distribution to facilitate better habitat management for elk. Alternatives 1 and 3 moves toward native plant communities in uplands and riparian areas and creates improved riparian health. This would benefit big game species.

Methodology for Migratory Bird Analysis

Montana Natural Heritage Program and Montana Fish Wildlife and Parks "Species of Concern" lists (MNHP 2009, MFWP 2009) were used to identify focal species for this analysis. A literature review was conducted for information on migratory bird habitat use and possible impacts associated with domestic livestock grazing on national forest lands. Agency monitoring and surveying records were reviewed for insight to migratory bird species occurrence, distribution and habitat use patterns across the Gallatin National Forest. Field surveys were conducted in grazed areas to identify potential habitat impacts and presence of nest predators.

Alternative 1 (No Grazing)
Alternative 1 would remove domestic livestock and associated facilities from the landscape in the Bangtails. Riparian vegetative communities would begin to recover from grazing, browsing and trampling associated with livestock grazing, but some impacts would continue due to use by wild ungulates. Ammon and Stacey (1997:7-12) examined bird communities in willow habitat currently grazed by livestock as compared to habitat that was historically grazed but from which cattle had

been excluded for thirty years. They found that streamside willows were much more abundant, vertical diversity of vegetation was higher, nest site availability was greater, and nest success was generally higher where livestock were removed than on recently grazed sites. Dobkin and associates (1998) also evaluated recovery of riparian systems where livestock grazing had been discontinued. They found vegetation on riparian meadows without livestock dominated by dense sedge cover, with dry grasses and a few shrubs found only in the uppermost portions of the riparian zone. Avian species richness and relative abundance were both consistently greater on non-grazed areas. Most riparian or wetland associated bird species were found only on the non-grazed sites, whereas upland associated species were found in the recently grazed riparian sites. Once livestock were completely removed, riparian vegetation began to recover with increased grass, forb, rush and cryptogamic (moss, ferns, lichen) cover, and a decrease in bare ground and litter. These authors noted that in their study, riparian recovery was driven not only by the cessation of livestock grazing, but was also influenced by annual variation in precipitation patterns (Ibid).

With livestock removed from National Forest lands in the Bangtails, invasive weed numbers would be reduced but non-native grasses are expected to persist. Under the No Grazing alternative, there would be little notable change in forested habitat and associated bird communities.

Alternatives 2 and 3

Alternative 2 (No Action) would leave livestock grazing management as it exists today, with no additional procedures adopted to facilitate resource management. Under this alternative, riparian use patterns would continue, with potential for expansion of riparian habitat degradation as cattle move into new areas once vegetation becomes denuded in favored areas. Upland habitat conditions would also remain largely the same, with some potential for expansion of negative impacts related to changes in native plant community composition and structure. Grazing systems and use periods would stay the same under this alternative. Current practices use deferred rotation systems, where cattle are turned onto allotments at the same time, but in different places each year. Overall season of use would not change. Under the Alternative 2 there would continue to be some degree of conifer encroachment into grass and shrubsteppe habitat, with no measures taken to curb or reverse this process.

Alternative 3 (Adaptive Management) would incorporate adaptive management practices designed to improve resource conditions through a more structured monitoring protocol while still permitting livestock. This alternative would emphasize proper stream form and function and associated riparian health. Improved riparian vegetative conditions would benefit a large proportion of migratory bird species. Alternative 3 would also emphasize better distribution of livestock, which would result in improved upland and riparian conditions. Weed treatment objectives and monitoring would further improve upland habitat. Grazing systems and timing of livestock presence on National Forest System lands could be changed under this alternative if monitoring indicated the need for resource protection. Later turn-on dates would reduce cattle presence during the primary nesting season. However, current start dates for Bangtail allotments are July 1 or later, which is already fairly late in the bird breeding season. Changing the timing and distribution of livestock use across the allotments could benefit migratory bird species by reducing the ability of nest predators and parasites to habituate to repeated patterns of livestock use.

Cumulative Effects for Alternatives 1, 2, and 3

Domestic livestock grazing has been influencing bird habitat in the Bangtail Range at least since the early 1900s. Bock and associates (1992) noted the importance of livestock as a keystone species; i.e. where they occur, livestock are key organisms in determining the structure of vegetation and function of ecosystems. Along with livestock came habitat conversion to human settlements and agricultural land, as well as habitat modification resulting from logging and fire suppression (Hejl and Young 1999).

Riparian and other wetland habitats are disproportionately affected by livestock grazing. In addition to grazing impacts, these habitats have also suffered from the development of dams, intensive water management practices, urban development, agricultural use, transportation systems, logging, mining, fire suppression and recreation. The combined effects of human presence on the landscape have made riparian habitats the most severely degraded ecosystems in the western states (Tewksbury et al. 2002).

Upland habitats have also been impacted by human uses in addition to livestock grazing. Logging has fragmented forest interior habitat important to many migratory bird species. In addition, timber harvest has produced grassy areas that, if grazed by livestock, could attract cowbirds and provide good opportunities for nest searching (Young and Hutto 1999). Livestock grazing removes fine fuels, which can alter natural fire regimes. Combined with active fire suppression, grazing can facilitate conifer encroachment, potentially resulting in the conversion of open meadows to woodlands, and of open woodlands to denser forests. At lower elevations, grazing and fire suppression have played a major role in the expansion of juniper woodlands (Saab et al. 1995). Conifer invasion of both upland and riparian habitats due to the combination of livestock grazing and fire suppression has altered bird species composition in some areas to communities dominated by generalist bird species (Ammon and Stacey 1997). Conifer encroachment has occurred in some areas of the Bangtail allotments.

Agriculture, livestock production and housing development on private lands contribute heavily to impacts of nest parasitism on nearby public land. This factor is evident from the literature in which proximity to major agricultural areas and human habitation (Tewksbury et al. 2002) are the most commonly cited factors influencing cowbird abundance and nest parasitism rates. Crop production, livestock feed and residential bird feeders provide seed sources for cowbirds. Livestock tend to be more concentrated on private land than free-ranging herds on public grazing allotments, and also tend to be present on private lands during the early stages of migratory bird breeding season (Chase and Cruz 1999). Human developments provide the short vegetation structure that facilitates cowbird foraging. Mowed lawns and roadsides are often used as feeding sites by cowbirds (Goguen and Mathews 1999).

Summary Conclusion for Alternatives 1, 2, and 3

All alternatives considered would be consistent with laws, regulations, and policy. However, Alternative 2 (No Action) is less responsive to Forest Plan direction regarding migratory bird habitat management in riparian areas (MA 7, p. III-19). Of the species of concern addressed in this section, Brewer's sparrow and grasshopper sparrow would benefit most from removing livestock from public lands, as they are the species most vulnerable to adverse impacts from continued grazing. The olive-sided flycatcher, has been documented as a host species for the brown-headed

cowbird, but is not considered a primary host so overall impacts to this species are probably minor. Cassin's finch, Clark's nutcracker, great gray owl and Swainson's hawk are likely neutral to livestock grazing activities in the Bangtails. Taking steps to reverse damage in riparian habitats and to eliminate or minimize potential for future degradation of riparian areas, either through removal of livestock (Alternative 1) or through aggressive livestock management and habitat rehabilitation (Alternative 3), would be of notable benefit to many migratory bird species.

Alternative 1 (No Grazing) would have the most benefits to migratory bird species in the Bangtail Range, since it would completely remove livestock use and associated impacts from the landscape in the project area. Alternative 2 (No Action) would have the greatest impact to migratory birds, since no fewer actions would be taken to reverse existing habitat degradation or to reduce potential future impacts associated with current grazing practices. Alternative 3 (Adaptive Management) would improve migratory bird habitat over existing conditions by taking proactive measures to protect and restore riparian areas and also to reduce the spread of noxious weeds.

Methodology for Analysis of Predators

District records and Montana Fish Wildlife and Parks personnel were consulted for information regarding predator species presence and abundance in the Bangtail Range. Grazing permit files were reviewed for documentation of livestock depredation problems on Bangtail allotments.

Spatial Analysis area for direct and indirect effects: Bangtail Allotments

Alternative 1 (No Grazing)
Removing all domestic livestock grazing operations from the National Forest lands in the Bangtail allotments would eliminate the need for predator control resulting from cattle depredations on public lands in these areas. However, there may still be domestic livestock present on private lands. Predator control actions could still be implemented in the project area in response to attacks on domestic pets, riding or pack stock, or threat to humans. Further, Montana Fish Wildlife and Parks department has the authority to initiate predator control measures, including legal hunting/trapping quotas, to manage excessive predator impacts on prey populations. Since predator control activities could continue in the Bangtails even if cattle were absent from the National Forest, Alternative 1 would likely have little notable impact on predator populations.

Alternatives 2 and 3
The Annual Wildlife Damage Management Plan spells out the specific activities, authorities and contacts for predator control actions related to livestock operations on National Forest Sytem lands. Under this Plan, wildlife damage management activities may involve both lethal and non-lethal measures, and could include control of coyotes, black bears, wolves and mountain lions in the Bangtail allotments. Wildlife Services predator control actions have been minimal in the Bangtail Range in recent years.

Alternative 2 (No Action) would continue livestock grazing management as it exists today, with no change in livestock types, class, numbers or grazing systems. Since predator control actions have been very limited under these conditions in recent years, we would not anticipate any major changes with continued livestock use, assuming the mix of predators stays the same in the Bangtail

Mountains. The situation could change if wolves move in and establish permanent territories that include the Bangtail allotments.

Alternative 3 (Adaptive Management) would incorporate adaptive management practices designed to improve resource conditions while still permitting livestock use on the National Forest. Although no major changes are anticipated regarding the need for predator control under this alternative, the adaptive management strategy does include measures that could be used to reduce the need for lethal control of predators should problems arise. Under an adaptive management strategy we would establish mechanisms to work with grazing permittees to explore alternative grazing practices for dealing with predation issues. Such measures might include adding range riders, using guard animals, installing predator deterrent mechanisms, and/or training permittees in proven methods of non-lethal predator control.

Cumulative Effects and Summary Conclusions for Alternatives 1, 2, and 3
Historically, the vast majority of predator control actions were associated with protection of livestock. However, lethal predator control can result from attacks on domestic pets, pack and riding stock, threats to humans, or even damage to agricultural resources. Many other factors influence predator populations as well, including legal hunting and trapping activities, habitat alterations associated with land uses such as agriculture, housing development, logging, mining and recreation. Human land uses not only impact predator populations, but also affect prey populations through habitat alternations, disturbance and direct mortality due to hunting, vehicle collisions and other factors.

Predator control related to livestock grazing operations has been a very minor factor for the Bangtail allotments under the existing livestock management strategy. Removing livestock from NFS lands (Alternative 1) would eliminate the need for predator control actions in the Bangtail allotments; however, livestock and predators could still overlap with the potential for conflicts on adjacent private land. Alternative 2 (No Action) has the highest potential for future predator/livestock conflicts to be managed with lethal control measures, although no drastic increases in predator control efforts would be anticipated under the current grazing regime. Alternative 3 (Adaptive management) provides the best environment in which to deal with predator issues with the least impact on predator populations, while still permitting livestock grazing as an appropriate use of National Forest System lands.

Biodiversity

Methodology for Analysis

Analysis for the biodiversity issue was conducted primarily by summarizing findings from the vegetation and wildlife issues. Literature was reviewed for pertinent information regarding livestock impacts on biodiversity.

Spatial Analysis area for direct and indirect effects: Public and private lands within the Bangtail Allotments

Direct and Indirect Effects
Considering the range of alternatives evaluated for this project, it is apparent that recent and current livestock grazing practices have had relatively minor effects on biodiversity, and that the primary impact may be due to cumulative effects from past actions.

Alternative 1 (No Grazing)
Removing all domestic livestock grazing operations from National Forest lands in the Bangtail allotments would eliminate further degradation of riparian vegetation and associated physical damage to streams. However, there could still be domestic livestock present on private lands. Continued use in these areas could have lingering effects on overall biodiversity throughout the Bangtail Range. Under this alternative, riparian vegetation would recover to some degree with time, although continued use by native ungulates could retard the recovery process. Riparian habitats provide high levels of plant species diversity and productivity, primarily due to the biotic and nutrient exchange between aquatic areas and adjacent uplands. Riparian areas also provide important habitat for a wide range of species from the smallest mammals, birds, reptiles and amphibians to the largest mammals and birds. Therefore, improved riparian habitat conditions would enhance biodiversity conditions within the Bangtail allotment areas. Although riparian vegetation recovery would benefit many wildlife species present in the project area, it would not likely attract new species or otherwise enhance species richness in the Bangtail Range.

Upland areas would not change quickly or notably with the removal of livestock although the control of noxious weeds should. Grazing by native ungulates would continue at existing or slightly increased levels. Removal of livestock would have little noticeable effect on forested habitat, but could change the plant and animal species composition along forest/non-forest edges, as these are the places cattle tend to congregate for thermal regulation.

Alternative 2 (No Action)
The No Action alternative would continue livestock grazing management as it exists today, with no change in livestock types, class, numbers or grazing systems. Riparian habitat use and associated degradation would continue at existing levels, or perhaps even spread to new areas with continued pressure from livestock. No measures would be taken to improve stream form or function in affected areas, nor would active measures be taken to change livestock distribution in a manner that reduces grazing impacts in riparian habitat. Further, no additional measures would be taken to reverse or slow the spread of livestock associated changes to plant communities in uplands or forest edge habitats. Maintaining livestock use under the current management strategy would continue to affect wildlife habitat, and thus influence wildlife use of available habitat. Wildlife species abundance, richness and composition may be affected in localized areas where livestock impacts are concentrated. However, at the broad scale; e.g. over the entire area covered by the Bangtail allotments, continuation of current grazing practices would not have obvious effects on biodiversity in the near future.

Alternative 3 (Adaptive Management)
Alternative 3 would incorporate adaptive management practices designed to improve resource conditions while still permitting livestock use on the National Forest. Under this alternative, active measures would be taken to reduce livestock pressure in problem areas, and to reverse undesirable trends in habitat conditions currently attributed to livestock use. With proactive measures built into

an adaptive management strategy, habitat recovery in damaged areas could occur at a more rapid pace than under Alternative 1 (no grazing). Enhanced habitat conditions, particularly in riparian areas, but also in upland and forest edge types, would promote biodiversity through increased plant and animal species richness and abundance in localized areas. However, at the broad scale, there would be little notable effects to biodiversity under this alternative.

Cumulative Effects for Alternatives 1, 2, and 3

Biodiversity is a complex concept that covers a broad spectrum of spatial and temporal scales. At the fine end of the spatial scale, biodiversity can be assessed at the molecular and genetic level while at the other end of the scale biodiversity may be considered at the landscape or even global level. Major impacts to biodiversity in the Bangtail Mountain Range have occurred over an extended period of time, and have been influenced by social and cultural aspects at a geographic scale much larger than one mountain range. Livestock grazing has certainly played an important role in the shaping of habitat conditions and the resulting suite of wildlife species present in the Bangtail Range today. Domestic sheep were grazed in the Bangtails in the past, which had proportionately more impact on drier habitats such as montane and subalpine meadows. Sheep however, had lower tendency to congregate in riparian habitats. Replacing sheep with cattle shifted the impact from uplands to moist habitats. As noted previously, livestock grazing has influenced the abundance and distribution of numerous large predator species across the US. Other factors that have influenced biodiversity in the Bangtails include vegetation changes resulting from timber harvest, road construction, prescribed fire, recreation development, road construction, housing development and agriculture. Much of the private property in the Bangtail Range was consolidated into large, contiguous blocks under the Gallatin Land Consolidation Act. Large blocks of private land are more conducive to development processes than are smaller, more isolated sections. Riparian and other wetland habitats have been disproportionately affected not only by livestock grazing, but also from water management practices, housing development, agricultural use, transportation systems, logging, mining, and recreation.

Considering the existing landscape in the Bangtails today, there is little difference between the alternatives regarding biodiversity at the landscape scale. At a smaller scale, considering localized impacts and potential for reversing damage caused by livestock use, Alternative 3 would take proactive measures and thus would probably result in the shortest recovery time for problem areas. Alternative 1 would remove the livestock grazing mechanism, and therefore eliminate the potential for increased damage due to direct impacts from livestock use. Problem areas would recover, but likely at a slower rate. Under Alternative 2, impacts would continue to occur in localized areas, and habitat degradation due to livestock impacts would have greater potential to spread to comparatively healthy areas.

Summary Conclusions for Alternatives 1, 2, and 3

The issue of biodiversity is at this point in time is not a major factor in the decision to be made among the various alternatives considered for livestock grazing in the Bangtail allotments. None of the alternatives, by themselves, would have notable impacts on biodiversity at the landscape scale in the foreseeable future. However, Alternatives 1 and 3 would likely result in improved habitat conditions in localized areas, which would promote biodiversity overall.

4.2.3 Livestock grazing could affect terrestrial plant life including: the composition and successional development of riparian and upland plant communities; the presence of invasive nonnative plants; and, the overall diversity of plant life.

4.2.3.1 Indicators for Direct Indirect and Cumulative Effects on Riparian Plant Communities:

Indicators of Direct and Indirect Effects:

- Qualitative discussion of direct and indirect effect of livestock grazing in riparian areas

Additional Indicators to Evaluate Cumulative Effects

- Acres of riparian area accessed by livestock
- Acres of riparian areas within 100 feet of roads
- Acres of logging in riparian

Methodology of Effects Analysis for Riparian Areas

Spatial and Temporal Extent of Analysis: The spatial extent of the direct and indirect effects is the private and public lands managed as part of the five allotments. Riparian areas were recognized as an important resource across these allotments and one of the resources threatened by a number of factors including livestock grazing (Chapter 2.9). Effects analyses on riparian areas were based on field inventories described in Chapters 3.2 and 3.3 and interpretation of 2006 digital color mapping (NAIP 2006). All stream locations were edited to improve accuracy (ArcGIS 9.2). To account for very narrow riparian areas not visible, the computer was used to create a 10-meter wide corridor on each side of the stream. Very few riparian areas wider than 20 meters exist. The reason for this is the area is generally steep and forested toward the bottoms of the drainages not allowing the development of conditions suitable for large riparian areas. Forest geographic information data (GIS data) displaying perennial and intermittent streams was overlaid onto the computerized aerial photography, soils and slope data (10 meter DEM) to identify riparian areas susceptible to damage by grazing. Those areas where grazing was not restricted be forest cover, topography, etc. were investigated in the field for livestock use (Project file – Hydrology and Wildlife). Once we had our field and computer inventory we compared the inventory to those areas of primary and secondary rangelands to evaluate how much riparian habitat is affected by grazing. This process formed the bases for our riparian analysis.

Alternative 1(No Grazing)

Direct and Indirect Effects: About 477 acres of riparian area exists and of that about 245 acres is accessed by livestock on national forest and private lands. About 174 acres of riparian area is grazed only on the National Forest. Dense forests, downed wood and steep terrain make livestock access to other areas very rare or absent. Since Alternative 1 removes livestock, there would be no direct or indirect adverse effects on riparian habitat related to livestock grazing on the allotments. Those effects attributable to livestock that have occurred over the last 100 plus years would eventually reverse themselves. Since livestock cause periodic or annual disturbance, riparian plant communities would begin to take a path toward later successional species and those more deep-rooted species associated with riparian areas where livestock are absent. It is unknown when riparian vegetation would completely recover. Several introduced species of plants including

noxious weeds could expand in riparian areas. There would also be continued use by wild ungulates continuing to create some lower level of disturbance of riparian vegetation. Willows and other woody plants could see areas of heavy winter use by wild ungulates. Past experience indicates that resting riparian areas from livestock results in improvement (Elmore and Platts 1991).

One indirect effect could be that if cattle are no longer permitted on National Forest lands within the analysis area, private lands may receive use that is more intensive. This is because the ranchers would need to use their private lands more intensively to compensate for the lost forage on the National Forest. This could indirectly and adversely impact riparian areas on private lands.

Alternative 2 (No Action)
Direct and Indirect Effects: Current permitted season of use and cattle numbers would remain the same. Bank alteration standards would not be implemented and additional range improvements would not be built. Existing water developments would be maintained to provide livestock watering and to provide improved distribution of livestock. Mineral placements and pushing livestock out of riparian areas by riders would continue to be used as a strategy under Alternative 2 to reduce use of riparian areas. Since no additional measures would be implemented under this Alternative to relieve use along streams, riparian areas that are currently impacted by livestock grazing would not recover.

Utilization checks on riparian vegetation along creek bottoms and moist sites frequently record use higher than prescribed on these allotments especially during drought years. On the Willow Creek, Bangtail Creek Allotments, riparian areas have been adversely affected by livestock. Bank trampling, utilization of riparian grasses and some grazing of willows are evident. The permittee operating on the Willow Creek and Bangtail Creek Allotments is working voluntarily to implement bank trampling standards. Improvements are documented but all problems have not been resolved. In 2009 a new rotation schedule and grazing pattern is planned that would substantially reduce the amount of use in both allotments and implement a deferred grazing system. This is being done on a trial basis.

Only a small amount of the land area and available forage in the Bangtail Mountains is linked to riparian areas. Analyses shows that riparian areas provide about 2 percent of the total acres grazed across the five allotments. In other words, in the Bangtail Mountains, uplands contribute most to livestock forage. However, out of the estimated total of 477 acres of riparian habitat, 245 acres are accessed by livestock or about 51 percent.

Alternative 3 (Adaptive Management)
Under Alternative 3, the season of use may decline with the implementation of riparian grazing guidelines. This is because experience has shown that the bank alteration standards are typically met before any of the other forage utilization guidelines. This results in the livestock being removed early. Cattle numbers and seasons of use may remain the same as currently permitted if cattle use can be redistributed to uplands and lesser used areas of the allotment and trampling disturbance along streams remain within standards. Management Actions proposed under Alternative 3 and the oversight of the Adaptive Management Implementation Team would provide better opportunities than Alternative 2 to begin recovery of degraded riparian areas but not as quickly as Alternative 1 (Elmore and Platts 1991). Installations of water developments and

repairing non-functioning improvements, formation of additional pastures, and mineral placements are examples of proposed Management Actions that would redistribute use out of riparian areas. Alternative 3 proposes streambank alteration standards for all non-functioning and functioning at risk steam reaches (Chapter 2.9). The acres accessible to livestock would be the same as Alternative 2 but the level of use is expected to decrease.

Cumulative Effects on Riparian Areas

Spatial extent of effects analysis: The cumulative effects analysis for riparian areas is the five allotments including both public and private lands within the allotment boundaries. This spatial extent was selected because lands beyond the allotments are private and data is unavailable.

Temporal extent of effects analysis: Past actions include all those human-related activities that are still evident on the landscape such as open or decommissioned roads, livestock grazing, and logging in riparian areas. Present activities include anything that is currently being implemented or just completed with the last year. Proposed actions include any project that have a published proposed action or that is on the Forest quarterly projects list. Foreseeable activities are those projects proposed in some other approved plan through 2015.

Cumulative Effects and Summary Conclusions for Alternatives 1, 2, and 3

Livestock grazing along with many other activities are influencing overall riparian health. There have been approximately 19,500 acres of logging in the Bangtail Mountains over the past 30 plus years (ArcGIS 9.2) with the majority on private land. Much of that land was involved in a land exchanged in the 1990s and is now part of the Gallatin National Forest. In some areas, logging left only very narrow buffers of riparian vegetation. This has affected streamside vegetation and the health of riparian systems. Along with logging, many of the roads in the Bangtails are close to streams. This has disrupted hydrology and affected streamside vegetation and other aspects of watershed hydrology (Forman et. al. 2003). These factors contribute cumulatively to riparian health. Table 4.2 summarizes these activities.

Table 4.2 Summary of Cumulative Effects on Riparian Areas.

Alternative 1					
Activity	**Past**	**Present***	**Proposed**	**Foreseeable Activities**	**Cumulative Effects**
Acres of riparian area accessed by livestock	245	No change	-245	No change	0
Acres of riparian areas within 100 feet of roads	80	-20	0	0	60
Acres of logging in riparian	186	No change	0	None	186
					246 acres
Alternatives 2 and 3					
Acres of riparian area accessed by livestock	245	No change	0	No change	245
Acres of riparian areas within 100 feet of roads	80	-20	0	0	60
Acres of logging in riparian	186				186
					431 acres

*In 2006 and 2007 over 60 miles of roads were decommissioned in the Bangtails. This substantially reduced the acres of riparian area influenced by roads and is reflected in the present column.

4.2.3.2 Indicators for Direct Indirect and Cumulative Effects on Upland Plant Communities:

Indicators for Direct and Indirect Effects:

- Acres of livestock grazing in uplands
- Comparison of Updated Stocking Level Estimates to Recent Stocking Levels

Additional Indicators to Evaluate Cumulative Effects

- Acres of livestock grazing in uplands
- Acres of road surface
- Acres of logging
- Acres of invasive species
- Acres of prescribed fire
- Conifer encroachment

Methodology of Effects Analysis for Upland Areas

Everything not included in the riparian analysis was considered part of the upland areas. A livestock grazing suitability and capability analysis was conducted and documented in Chapter 3.4. This evaluation was based upon: 2008 vegetation classification (Project File-VMAP 2008); Forest Service Manual and Handbook direction (FSM 2200); the Gallatin National Forest soil surveys (Davis and Shovic 1996); and, past monitoring of utilization and rangeland conditions (District Rangeland Monitoring Data 2200 files 1982-2008). Most of this analysis process was completed using Geographic Information Systems (GIS) computer technology (ArcGIS 9.2). The suitability and capability analysis calculated acres of primary and secondary rangelands on each allotment along with the Animal Unit Months (Project File - Vegetation). The effects analysis compares current livestock stocking levels to what the capability and suitability analysis suggests should be the grazing levels. A qualitative discussion then reviews this comparison to historic utilization records. The objective of this comparison is to determine whether stocking levels are consistent with grazing capacities for the uplands based on past monitoring. A separate section below discusses the indirect effects of livestock related to the spread and establishment of noxious weeds described in Chapter 3.3.

Alternative 1

Acres of Livestock Grazing in Uplands: About 9,493 and acres of primary and secondary rangelands are access by livestock (table 4.3). Removing livestock would affect these acres by eliminating the effects livestock have on the plant communities in these areas. Wild ungulates would continue to graze upland plant communities and influence the plant community development. Some literature indicates that reductions in livestock grazing can cause a shift in use patterns of wild ungulates (Crane et. al. 2001, Alt et. al. 1992). Mccarthy (2003) and Crane et. al. (2001) indicate that elk use shifted away from lands not grazed by livestock to those areas that were either lightly or moderately grazed by livestock. Literature also suggests that merely removing livestock does not always result in the recovery of rangelands (Curtain 2002). Therefore, with the removal of livestock we could see a shift in plant communities less favorable in some areas. However, the extent and locations of these areas is not known.

Alternatives 2 and 3

Acres of Livestock Grazing in Uplands: Table 4.3 displays the percent of the uplands accessed as primary range by livestock. Primary rangelands are those lands no steeper than 40 percent slope. Distance to water and soils were not a factor in the determination of primary rangelands. Uplands consist of those areas not identified as riparian areas. This includes aspen, sagebrush, native grasses, non-native grasses, logged areas, open forest, areas of forbs, and forest areas, etc.

Allotments with a lot of accessible primary rangelands have more area affected but also may have a better opportunity for dispersing livestock use over a large area. Alternative 2 would continue to distribute livestock use as it has been over the last several years. Acres accessed under Alternative 3 are similar to Alternative 2. However, Alternative 3 implements several management actions to improve the distribution and use of the uplands by livestock. Bringing additional water developments on line would help redistribute livestock use. Implementing bank trampling standards would indirectly help because livestock herders would be on the allotments more frequently to redistribute the livestock. Review by the Adaptive Management Implementation Team would increase oversight and provide more opportunity to detect overstocking and livestock distribution issues. It is anticipated that Alternative 3 would improve upland conditions in line with the objectives described in Chapter 2.3.

Table 4.3. Uplands Grazed in each Allotment. This table shows the acres grazed in each allotment on National Forest System lands.

Allotment	Total Primary and Secondary Upland Range in Allotments (acres)	Upland Primary Rangelands (acres)*	Percent of Total Uplands Grazed as Primary Range
Bangtail Creek	1,265	964	76%
Canyon Creek	3,151	2,682	85%
Jackson Creek	2,040	1,378	68%
Stone Creek	758	534	70%
Willow Creek	2,279	1,380	61%
Totals	9,493	6,938	73%

*Riparian acres have been subtracted out for each allotment. This figure includes open forested areas.

Comparison of Updated Stocking Level Estimates to Recent Stocking Levels: Table 4.4 compares current grazing levels with the suitability and capability analysis documented in Chapter 3.4. Alternative 1 would remove livestock and the indicated AUMs available for livestock grazing would be unutilized by livestock. This would make more forage available for wildlife. However, competition for forage is not evident. Within the Canyon, Stone, and Willow Creek Allotments, livestock stocking levels calculated for this analysis indicate these allotments could potentially support more animal unit months (AUMs) while calculations for the Bangtail and Jackson Creek Allotments indicate we may be overstocked. As far as the stocking estimates go, we know we used very conservative production levels in our calculations to estimate grazing levels and utilization monitoring indicate that during most years, most primary range areas on these allotments are within prescribed limits (District Range Files 2200). Alternatives 2 and 3 would stock the allotments at the current level. Past monitoring indicates stocking levels are about right. For the time being there does not appear to be any reason to adjust livestock numbers up or down based on the suitability and capability analysis.

Under Alternative 3 monitoring would provide input for making adjustments in the timing and duration of grazing along with adjustments in livestock numbers. Years of forage data collection both in dry years and moist years is the best way to improve the stocking estimates and Alternative 3 would provide the best opportunity to do this under its monitoring and oversight plan.

Table 4.4 Calculated AUMs compared to current permitted. Totals include National Forest lands managed as part of the allotments.

Allotment	Land Status	Current permitted AUMs	Updated AUM Calculation	Potential Over or Under Stocking
Bangtail Creek	Forest	193	145	**+48**
Canyon Creek	Forest	372	433	-61
Jackson Creek	Forest	376	290	**+86**
Stone Creek	Forest	48	130	-82
Willow Creek	Forest	211	292	-81

Cumulative Effects on Uplands

Spatial extent of effects analysis: The area included the cumulative effects analysis is the five allotments on National Forest and any private lands managed in conjunction with the allotments that are under private lease or permit as of 2008.

Temporal extent of effects analysis: Past actions include all those human-related activities that are still evident on the landscape such as logging, road construction, acres of invasive species, acres of livestock grazing, and prescribed fire. For the purpose of this analysis we predicted changes out to 10 years.

A number of activities contribute cumulatively to the conditions found in upland areas. Many of these activities happened years ago such as logging and road construction but their effects still influence uplands.

One aspect of changes in the uplands that is not evaluated here is the amount of area occupied by conifers compared to historic levels. Scientific literature documents that livestock grazing and fire suppression both promotes the encroachment of conifers into rangelands (Gruell 1983, Belsky and Gelbard 2000, Gallant et. al. 2005). Additional area now occupied by conifers may be around 20 percent higher compared to historic levels (Gallant 2005).

Cumulative Effects Alternatives 1, 2, and 3

Changes in the status of grazing permits under Alternative 1 may cause permittees to switch to development or other non-agricultural uses of their private lands (see discussion under Chapter Economics 4.4.3). Although, no subdivisions are proposed within any of the private lands on the allotments at this time (Gallatin County pers. con.).

Table 4.5 summarizes the estimate of total amount of area potentially accessed by livestock within private and National Forest managed as part of the allotments. Based on our analysis (Project File – Vegetation) there are an estimated 14,011 acres of rangelands and logged areas (transitory range) that livestock can potentially access in the uplands on National Forest and private lands. Of that total, 8,760 acres are logged leaving 5,251 acres of both primary (40 percent slope and less) and secondary rangelands (over 40 percent slopes).

Livestock access a total of 10,803 acres on the National Forest with 5,183 being rangelands and the rest open logged areas. Since Alternative 1 would remove livestock from the National Forest, 10,803 acres would no longer be accessed by livestock with 5,620 being rangeland vegetation types. The other alternatives remain unchanged although we anticipate improvement under Alternative 3 that by 2017 we will see a positive trend in improving the composition of native plant communities across the landscape.

Table 4.5. Cumulative total acres grazed in the uplands.

National Forest Plus Private Lands	**Acres**
Total Area National Forest and Private Accessed by Livestock	14,011
Open Logged Forests (transitory rangelands)	8,760
Amount Rangelands	5,251
National Forest Lands Only	**Acres**
National Forest Accessed by Livestock	10,803
Open Logged Forests (transitory rangelands)	5,620
Amount Rangelands	5,183

There are a total of about 5,620 acres logged within the allotments. Nearly all have regenerated with young forests. We do not know when the regenerated areas would be classified as "forest" again so for the purpose of this analysis we classified logged areas as still having a cumulative effect on upland vegetation.

Another cumulative effect on uplands is weeds. The Bozeman District has proposed that all weeds sites would be treated at least once every three years. Based on the information in Chapter 3.4, there are 1,294 acres of road surfaces and roadsides (assumes 35 feet either side of centerline) that need at least spot spraying of noxious weeds plus 419 acres of known weeds sites most of which are away from roads that are not counted in the roadside total (Chapter 3.4). Noxious weed effects on uplands are expected to lessen under all alternatives. This is assuming that all roadsides including decommissioned roads are treated at least once every three years (Chapter 4.2.2.3) as planned. Knowing that livestock are a vector for the establishment of many weeds we can assume that under Alternatives 1 there should be a more noticeable improvement within the decade in the uplands compared to Alternatives 2 and 3. This is especially true assuming weeds would be treated every

third year. Alternative 2 would show a reduction in the acres of weeds under the District treatment schedule but not as much as Alternatives 1 or 3. Alternative 2 does not have as aggressive a monitoring strategy as Alternative 3. Also Alternative 2 does not allow the flexibility to change grazing strategies like Alternative 3. These things could reduce the effectiveness of weed control. Since Alternative 3 has an objective of 50 percent reduction by 2018 we assume that that Alternative would show this much improvement in upland acres. The improvement in Alternative 3 is the result of implementing monitoring and oversight by the Adaptive Management Implementation Team, implementing grazing strategies that improve the general upland vegetation health and weed control. Alternative 1 would have at least as much improvement as Alternative 3 because not only would weeds continue to be sprayed but livestock are removed as a weed transport and establishment vector. We do not know exactly how much of a reduction in weeds would occur under Alternative 1 but it would be higher than Alternatives 2 and 3.

There have been 99 acres of prescribed fire implemented in the recent past plus another 519 proposed in the uplands already approved under a separate decision (Madison and Bangtail Prescribed Burning Project Decision Memo 2006). None of the alternatives propose prescribed burning but Alternative 3 does highlight burning as a potential tool available to improve ecological conditions if needed under a separate analysis.

Chapter 3.4 documents estimates of rangelands replaced by conifers and that fire suppression has allowed conifers to establish in areas never before occupied by forests. Using historic mapping, one study found that conifer forests of mostly Douglas-fir had expanded by about 20 percent over the last 100 years (Gallant et. al. 2003). In the Bangtails, this process continues. The edges of forests often have young conifers becoming established in adjacent sagebrush; evidence of expanding encroachment.

There is also documentation that livestock grazing contributes to encroachment (Belsky and Blumenthal 1997). However, it appears that most encroachment has occurred on steeper areas less accessed by livestock. Conifer encroachment has reduced the amount of available forage for livestock and wild ungulates (District Range Files 2200). Encroachment also has reduced the amount of ground water recharge to streams, altered fire regimes (Bradley, et. al. 1992), and reduced the number of seral conifers including rocky mountain juniper and limber pine (Project File -Vegetation). Limber pine is further threatened by exotic white pine blister rust and a mountain pine beetle epidemic. A close relative to limber is whitebark pine. Whitebark pine may be petitioned for listing on the Federal Threatened and Endangered Species List. Chapter 3.4 estimates there could be 4,562 acres where conifers may be affecting uplands through encroachment. Some conifer encroachment in rangelands has been removed during logging over the past several decades. However, the majority of logging has been focused on “true” forest types. Any influence that grazing has on encroachment would continue under Alternatives 2 and 3. It is assumed this would be a negative effect. It also appears that most of the encroachment is occurring on steeper slopes not accessed much by livestock and that fire suppression alone could be the biggest contributor. Therefore, even Alternative 1 is expected to perpetuate conifer encroachment.

Summary Conclusions for Alternatives 1, 2, and 3

Cumulatively, the uplands have been subjected to many changes. Most are not the result of grazing but logging and fire suppression. Grazing does influence many acres of upland plant communities in general and also appears to have some influence on the number of acres infested by noxious weeds

which also are impacting the uplands. Alternative 1 would remove livestock from the uplands however there is some debate about whether removing livestock might result in poorer upland conditions. This is typically because ungulates are no longer providing nutrient recycling, disturbance, etc. (Freilich et. al. 2003). In these areas, elk, deer and other animals browsing uplands plants would still be present so this may not be a factor. But in many systems, grazing has been shown to improve forage quality (Adler et. al. 2001, Alt et. al. 1992). Literature documents that site characteristics play a more important role than grazing in plant species diversity (Curtain 2002). It does not appear that grazing threatens the diversity of plant life in this area. Certainly, the removal of livestock would eliminate the opportunity to use livestock as a tool against invasive species such as non-native grasses. One unknown with Alternative 1 is whether the closing of livestock allotments would result in private landowners concentrating grazing use on their own lands to compensate for lost forage on public lands. Direct, indirect and cumulative effects analysis show Alternatives 2 and 3 to be very similar in total amount of area affected. Alternative 2 would still have more potential for effects on uplands, less emphasis is put on controlling livestock use and there is less formal monitoring.

4.2.3.3 Indicators for Evaluating Direct, Indirect and Cumulative Effects of Invasive Non-native Plants

Indicator for Direct and Indirect Effects:

- Qualitative and quantitative discussion of how livestock grazing would influence the establishment of invasive plants

Additional Indicators to Evaluate Cumulative Risk of Weed Establishment:

- Environmental variables such as slope, elevation, roads, presence of livestock, logging, aspect, etc.

Methodology for Direct and Indirect Effects Analysis

Spatial Extent of Analysis: Analysis of the direct and indirect affects of livestock on weeds was conducted by considering the fact that livestock act as a pathway for weeds and how this pathway interacts with the environment. The spatial extent for the direct and indirect effects analysis is the National Forest System lands contained within the 5 allotments. This area was chosen because it is the area directly affected by this decision. The spatial extent of the cumulative effects analysis boundary includes the five allotments plus a buffer of about 2 miles extending beyond the allotment onto private lands and other ownerships. This area of analysis was chosen because that was the extent of our data. Also, the further away from the project area the more roads and human settlement influence the risk of weed establishment until, eventually, decisions made on the allotments become inconsequential.

Existing vegetation is an important part of weed management and directly affects how easily weeds become established. Vegetation is currently being mapped for National Forest System lands east of the Continental Divide and is not available until later in 2009. So for this analysis we used the same data derived for the rangeland suitability analysis in Chapter 3.4. Using that data, the Gallatin National Forest Soil Surveys, and topography (digital elevation models) we were able to identify areas more susceptible to livestock-related weeds. Examples include; aspen, riparian areas, forb-

dominated areas, areas of native and non-native grasslands, open forest, sagebrush, sparsely vegetated areas such as road surfaces. These susceptible areas were identified across the landscape, and a qualitative and quantitative discussion provides a comparison between Alternatives. The only areas we considered safe from weed establishment (based on the weed species we currently deal with) are areas of intact dense forest cover.

Some weeds use the livestock pathway better than others. For instance, different species survive the digestive system better than others and some cling better to hair (Olsen 1999). Houndstongue appears to be the species in this area most favored by livestock because it is easily transported in the animal's hair.

The affects analysis assumes the required and recommended grazing-related Forest Service control and prevention measures described in Chapter 2.9 would be implemented for Alternatives 2 and 3 (FSM 2081.2).

Alternative 1

As discussed in Chapter 3.4, once a seed gets deposited there are many environmental factors that determine whether it germinates and becomes established. Cool, wet aspects with lots of competing ground vegetation, not much sunlight, duff layers, etc. would not be as conducive to weed establishment as are warmer drier aspects. In fact, all the cover could be removed from a cool north facing slope and chances are not many weeds would establish there. Drier lands with little or no forest cover would react differently.

Once weeds are established their success can be facilitated by cattle grazing. Olsen (1999) and DiTomaso (2000) write that cattle preferentially feed on grasses causing a shift in plant community composition away from grasses. What this effectively does is favor forbs. Since many weeds are forbs, cattle graze the surrounding grasses. This reduces the competition on the weeds. All of the listed weed species in the Bangtails are forbs. This means that cattle grazing would favor them.

Alternative 1 would remove livestock grazing from the five allotments. This would directly result in the livestock being removed as a pathway for weed seed transport and establishment on primary and secondary rangelands. There are about 8,204 acres of primary rangelands and 2,600 acres of secondary rangelands in the allotments on the National Forest (ArcGIS 9.2). Removing grazing would more directly affect primary rangelands and indirectly affect secondary rangelands since primary rangelands are most accessible and receive the most use.

Removing livestock under Alternative 1 does not mean the weeds would disappear from the landscape. All the other pathways would still be in place (see Cumulative Effects). Also, some livestock can actually reduce the incidence of weeds (Olsen 1999). Sheep or goats for example could be used as a weed suppression tool under the Forest Weed EIS (USDA 2005). Additionally, cattle can be used to strategically graze invasive non-native grasses (not listed as noxious weeds) if cattle are on the allotments when those grass species are most palatable.

It can be assumed that livestock would no longer be a vector for many weeds and could make control of weed somewhat easier. How much easier is not known. While literature often documents a negative role of grazing on weed establishment and spread (Freilich, et. al. 2003), there

are also examples documenting the opposite. DiTomaso (2000) documents that when done properly, grazing can maintain desired plants and provide a more competitive environment. Therefore, the exact effect of livestock removal under Alternative 1 is not known.

District weed suppression would continue in the allotments. The allotments would be put on a three weed treatment rotation.

Alternatives 2 and 3

Under Alternatives 2 and 3, livestock would continue to directly facilitate weed establishment on primary and secondary rangelands. They would also indirectly facilitate weeds establishment on adjacent areas not grazed by livestock. Any remote ungrazed or little grazed area suitable for the establishment of a weed species can be considered at risk under Alternatives 2 and 3.

Because Alternative 3 provides a greater degree of flexibility in grazing choices it can be assumed that less of an overall risk is associated with this Alternative compared to Alternative 2. Alternative 3 includes a much more structured monitoring plan and objectives. It would provide oversight by the Adaptive Management Implementation Team that would provide a clearer understanding of how management actions affect weeds. The Alternative also provides the flexibility to experiment and evaluate actions. Livestock could be used more as a tool to control weeds under Alternative 3. Alternative 3 would be more efficient at addressing the weed problem and would provide the opportunity for more effective suppression strategies compared to Alternatives 1 and 2. Alternative 3 includes the following objective:

> Halt the expansion of established noxious weeds, eliminate infestations of new weed species, and maintain weed-free areas by 2018.

It would establish a positive trend by: completing weed inventories on allotments with no inventories; removing weeds from 80 percent of the roads; and keeping weeds on roads in check. This would all be accomplished by 2012 to make sure the Alternative is on schedule to meet the 2018 objective. These should be attainable especially if the Adaptive Management Implementation Team helps schedule and set priorities for weed suppression.

Cumulative Effects

Spatial Extent of Analysis: Montana State University (MSU) worked cooperatively with the Forest to evaluate weed risk on a cumulative basis using a locally based weed model with the best local data available. The Non-native Invasive Species Risk Assessment Model (Weed Model) (Backus and Rew 2009) was used to predict the risk of weed establishment with and without the presence of livestock. Some of the environmental variables considered in the model include: slope, elevation, aspect, solar radiation, distance to roads and trails, grazing, logging, burning, and vegetation over.

The cumulative area included in Weed Model was the allotments boundary (Appendix 1- Map 5). We chose this area based on available data. Also, it was apparent that if the cumulative effects area got too large the effects of management decisions on these allotments might become less detectable. This is because more factors influencing weed risk are present the further you get from the Forest essentially diluting actions happening on the allotments that relate to weeds.

Cumulative Effects for Alternatives 1, 2, and 3

Appendix 1, Maps 5 and 6 provide a spatial display of the weed model output for houndstongue. Five different ratings are displayed; very low (0-10 percent), low (10-20 percent), medium (20-40 percent), medium high (40-60 percent), and very high (60-100 percent). Three weed species were modeled; spotted knapweed, houndstongue, and Canada thistle. Houndstongue and Canada thistle are the most prevalent in the allotments. Spotted knapweed is only known to be present in a few small patches. Other species are present but not modeled because they are poorly represented or data for these species were no available to calibrate the model.

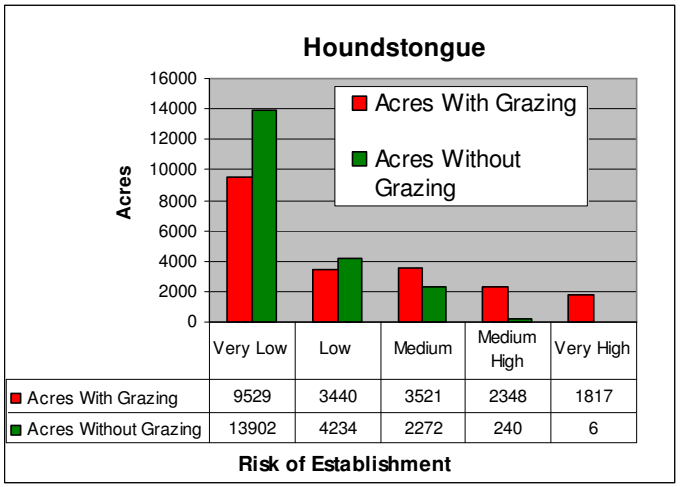
Under Alternatives 2 and 3, Canada thistle and houndstongue bear positive correlations with grazing (figure 4.2) resulting in a net increase of the probability of occurrence when grazing is present. Under Alternative 1, spotted knapweed, on the other hand, displays a negative correlation with grazing according to the data set for the Bangtails. This negative correlation results in a net decrease in probability of occurrence for those species when grazing is introduced, and a net migration of acreage from higher probabilities to classes of lower probability (figure 4.2). We are not sure why spotted knapweed showed this result. Specifically, the analysis shows a shift of 5.8 percent and 8.4 percent of acres in the lowest probability range to higher probability ranges for Canada thistle and houndstongue, respectively, when grazing is present and a 5.5 percent increase in acres to the lowest probability range for spotted knapweed with grazing (Backus and Rew 2009).

As described in the Weed Model numerous environmental factors determine weed risk. Roads are the biggest and most chronic source of weeds on the Forest. There are about 258 acres of road surfaces across the allotments (Arc GIS 9.2). Regardless of the Alternative, roads surfaces would continue to be vectors for weed transport and establishment even though about 106 acres of road surface was decommissioned in 2006 and 2007. We do know that livestock use roads as trails to get from place to place and this may be contributing to weeds along roads. Most decommissioned roads restrict the use by cattle. About 8,760 acres of forest were clearcut logged when under private ownership up to three decades ago (ArcGIS 9.2). These logged areas were included in the weed model. Many of these clearcuts are now managed by the Forest Service and are becoming reforested. As the forest reestablishes their susceptibility to weeds diminishes.

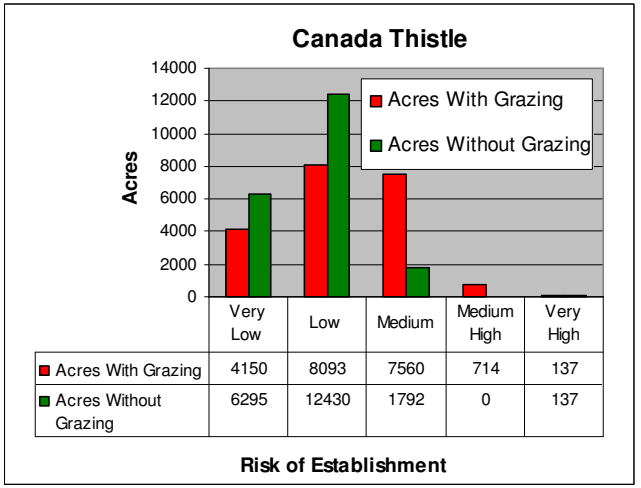
Another factor in weed management is the cost of control. This can be influenced by local and national economies and political decisions at all levels of government. Regardless of how much money is allocated each year, we have a good idea what it would cost to control the weed problem in the Bangtail allotments at this point in time. Based on what we know of current weed populations and knowing what recent weed suppression contracts have cost, the following estimates were made. Also, based on experience we know that we would need to retreat areas at least every third year then return on an as-needed basis to keep up on problem areas.

- Roadside spraying: $60 (based on recent contracts)/mile x 63 miles of open road = $3,780
- Decommissioned roadside spraying: $300(estimated)/mile x 62 miles of decommissioned road = $18,600
- Off road spraying: 419 acres (known infestations) x $45/acre (based on recent contracts) = $18,855
- Total Cost of Spraying all Known Sites Every other Year: $41,235 total/3years = $14,297/year

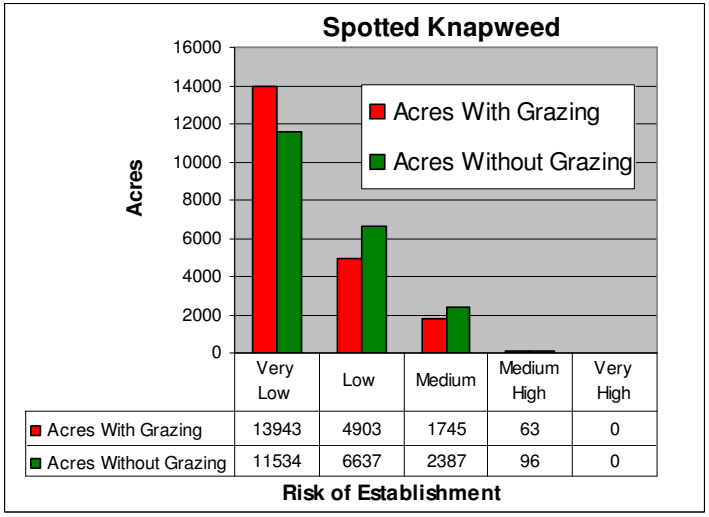
Removing cattle may or may not save on the cost. It may over time but for the first several years we assume the absence of livestock would not make much difference in cost.



	Very Low	Low	Medium	Medium High	Very High
Acres With Grazing	9529	3440	3521	2348	1817
Acres Without Grazing	13902	4234	2272	240	6



	Very Low	Low	Medium	Medium High	Very High
Acres With Grazing	4150	8093	7560	714	137
Acres Without Grazing	6295	12430	1792	0	137



	Very Low	Low	Medium	Medium High	Very High
Acres With Grazing	13943	4903	1745	63	0
Acres Without Grazing	11534	6637	2387	96	0

Figure 4.2. Weed Establishment Risk. Graphs display the probability of occurrence rating with and without grazing.

Summary Conclusions for Alternatives 1, 2, and 3
Weeds would be managed under all the Alternatives. Even if livestock are not grazed on these allotments, the District would suppress weeds in the Bangtails. The difference between the Alternative 1 (No Grazing) and Alternatives 2 and 3 is the presence of cattle as a pathway for weed establishment and movement. Using goat or sheep grazing as a form of weed control could be considered under any of the Alternatives (USDA Forest Service 2005). Using cattle as a tool to control weeds or invasive non-native grasses would be allowed under Alternatives 2 or 3.

Ninety percent of the weeds are located along roads. Weed treatment along roads would contribute the most toward reducing the weed problem. This is true Forest-wide. Weeds on roads may not have that much to do with cattle and more to do with other pathways such as vehicles, and site conditions. For example, roads are a constantly disturbed area relatively free of competing vegetation. There are many places on the District where livestock are not grazed that have major weed problems along roads.

4.2.4 Issue: Changes in livestock grazing on public lands and the associated costs could affect livestock operations and the grazing fees collected from permittees may not provide a positive return to the Federal Government.

4.2.4.1 Indicators for Direct Indirect and Cumulative Effects on Economics

- Present Net Value
- Benefit Cost Ratio
- Affects on Permittee Operations

Methodology for Analysis

This economic analysis consists of a comparison of the benefits and costs of operating these allotments or closing them to grazing. Alternatives 2 and 3, which would continue grazing, were evaluated for the next ten years (life of a grazing permit). Not considered was grazing fee level changes; they were assumed to stay at 2009 levels. Evaluating grazing fees is beyond the scope of the analysis. No attempt was made to try to quantify recreational user days, or to put economic values on wildlife, etc. Also not included is the cost of conducting this environmental analysis.

Alternatives 1, 2 and 3
Table 4.6 displays a comparison of present net value and benefit cost ratios for each Alternative. Costs included in the analysis include such things as construction and maintenance of fences, administration of the allotment by Forest Service, the cost of materials for improvements, noxious weed management, transportation costs, etc. The Forest Service typically provides fencing and water development materials but not always. Often the permittee incurs the entire cost. For the purposes of this analysis, we assumed the Forest Service would pay for materials related to the maintenance and development of improvements and the permittee would provide the labor. The Benefits include grazing receipts.

Table 4.6. Present Net Value and Benefit Cost Ratio.

Indicator	Alternative 1	Alternative 2	Alternative 3
Benefits	$0	$15,092	$15,092
Present Net Value*	-$111,665	-$146,990	-$170,433
Benefit/Cost Ratio	0	0.09	0.09

Alternative 1 would have a one time expenditure of removing allotment improvements such as fences and water developments. Alternative 3 would result in the highest cost because of increased administration that includes additional short and long-term monitoring and field reviews by the Adaptive Management Implementation Team. It also proposes the construction of seven water developments. The reason the cost of implementing any of the Alternatives is so negative is because of the cost of treating noxious weeds. Weed treatment runs on average over $14,000 per year to cover all roadsides and known weeds sites at least once every three years. If we subtract out the cost of weed treatments as displayed in table 4.7 we see the huge cost of treating weeds over a 10 year time period. The cost of weed treatment is assumed to stay the same for Alternatives 2 and 3 while in Alternative 1 it is assumed to drop by 50 percent in year 6 because of the absence of livestock. This is only a rough estimate but is an attempt to reflect the reduction indicated in Chapter 4.2.2.3 when livestock are removed from the weed risk analysis model. The actual reduction caused by the removal of livestock may not be this high. Alternative 1 has the lowest present net value because of the one time cost of removing improvements across the allotments.

Table 4.7 Present net Value and Benefit Cost Ratio s without Weed Treatment

Indicator	Alternative 1	Alternative 2	Alternative 3
Benefits	$0	$15,092	$15,092
Present Net Value*	-$30,054	-$12,093	-$20,536
Benefit/Cost Ratio	0	0.56	0.42

Affects on Permittee Operations: A study conducted by Foulke (2006) in Park County Wyoming found that profitability for some ranchers approaches zero without federal grazing lands. This situation is similar on allotments in the Bangtail Mountains. These are not large operators. All the permittees rely on federal lands for an important part of their operations. All of the operators in the Bangtail Allotments own nearby ranches that often adjoin their permitted areas. Permittee use of federal lands provides important seasonal forage that can not be provided on their private lands.

Much has been written about the pros and cons of public land grazing. Much of this discussion revolves around on what happens to private ranchlands when ranching is no longer profitable. Ranch income is typically low making operations marginal and slight changes in costs can push operators out of business (Foulke 2006). It is not unusual for ranches to be sold to developers for subdivisions or to wealthy persons for the construction of seasonal homes. While zoning, conservation easements, and other land management planning can help over the long-term there are no guarantees these strategies would be employed here. Indications are the subdivision of land and population growth in and around Bozeman is going to continue indefinitely. Bills have been

introduced in the U. S. Congress that would offer ranchers a buyout of $175 per AUM. However, it was not clear where the money would come from to pay for the buyout (Rangelands 2004).

Federal grazing fees are low compared to other sources, but there are a lot of unseen costs to the permittee to graze on federal lands. Permittees pay all the labor and often the material costs to maintain fences, water developments, etc. In some cases permittees provide much of the noxious weed suppression efforts. These costs are often not incurred on other leased pastures where the rate per AUM is much higher.

Choosing Alternative 1 (No Grazing) would make all the ranch operations using these allotments less profitable and possibly unprofitable. At least some forage would have to come from other sources. This might mean having to bid on higher priced pastures and also incur the cost of transporting livestock.

If some or all of these ranch operations went out of business it is not anticipated there would be large direct local economic effect on the Bozeman area. The local economy is not as dependant upon agriculture as it once was. There may be some minor direct and indirect effects related to those persons employed in agricultural based industries in both Gallatin and Park Counties. However, Alternative 1 (No Grazing) would have a huge impact on the livelihood of permittees grazing these allotments.

Alternative 2 and 3 would provide the best opportunity for local ranches dependant upon these allotments to continue their operations. Alternative 3 would provide the best of the action Alternatives because it provides more oversight of the resources and flexibility in allotment management and is geared toward ensuring sustainable grazing practices.

Cumulative Effects and Summary Conclusions for Alternatives 1, 2, and 3

Many factors influence the future of livestock grazing and small ranch operations. As Foulke (2006) points out in his study, the livestock industry is changing because of rising productivity from mechanization and improved technology, which pushes livestock prices downward. Less profitability has resulted in fewer of the next generation wanting to take up ranching.

Alternative 1 could result in the loss of some ranching operations or at least substantially reduced incomes and force ranchers to seek an income elsewhere. Alternative 1 may result in ranchers selling their land. There may be some incremental cumulative loss to the livestock industry as a whole if several of the permittees are not able to continue their operation under the no grazing alternative. On a larger scale and throughout the State as more and more livestock operations become uneconomical there is expected to be a continued reduction in this segment of the State's economy (GAO 2005).

The costs of maintaining these areas as allotments would continue to increase under Alternatives 2 and 3. Without some resolution of the grazing fee issue no change in the predicted PNVs in tables 4.6 or 4.7 are anticipated. These alternatives would contribute most to the local livestock industry and cumulatively to the State's agricultural economy.

The long-term outlook around Bozeman is land sales, subdivisions and other developments. There is no reason to think this is going to change although the current recession certainly has greatly reduced local housing construction. Jobs are certainly at a premium and it would not do the local economic any good to create any more unemployment.

Development has an effect on local wild lands and wildlife. Wildlife is a large part of the Montana economy and losses in open space adjacent the Bangtails could play a critical role in wildlife issues such as big game migrations, hunting opportunities, and seasonal forage needs. Overall losses in wildlife resources whether related to bird watching or big game hunting could affect revenues collected by the State in hunting fees and local economies related to wildlife in general. These are not expected to prove substantial to the local economy but cumulatively across the State as more development and losses of open space occur this could become more important.

4.3 Other Disclosures

The Council on Environmental Quality (CEQ) "Regulations For Implementing The Procedural Provisions Of the National Environmental Policy Act" (40 CFR parts 1500-1508) provide direction on addressing the environmental consequences of an action (40 CFR 1502.16). This direction is met through the discussion presented in Chapters 3 and 4 of this document. In addition, the regulations specify certain considerations, consistency with which may not be apparent given that the discussion in this assessment is focused on individual resource issues. This section specifically addresses these other considerations or reference where within this document a discussion can be found. In addition, this section identifies addresses Executive Order 12898 – Environmental Justice.

4.3.1 Irreversible and Irretrievable Commitment of Resources (40 CFR 1502.16)

An irreversible commitment of resources refers to the use or commitment of a resource that is incapable of being reversed or changed. An irretrievable commitment of resources refers to actions that result in changes to resources that can not be recovered or regained.

Effects of livestock grazing are typically associated with short-term commitments of renewable resources such as the consumption of forage. Allotment improvements such as fences and water developments are fairly easy to remove and their effects reversed. It is documented in Chapters 3.0 and 4.0 that livestock grazing contributes to changes in the species composition of upland and riparian plant communities. Some of these changes result in non-native plants including invasive grasses and noxious weeds dominating a site. While the Forest is committed to addressing the noxious weed problem, invasive non-native grasses are not an easy problem to solve. This may be considered an irreversible commitment of resources because although the technology exists to rehabilitate areas of non-native grasses it is not practical to think the economic resources would ever be available to make it happen.

Irretrievable commitments may be associated with Alternatives 2 and 3. For example, both Alternative 2 and 3 include the removal of vegetative biomass. We are making an irretrievable commitment to allow livestock to consume forage and alter the structure of plant communities that would otherwise be utilized by native wildlife. Alternative 2 does not address reduced stream form and function or reduced riparian health. This decrease could result in reduced populations of fish, and localized reductions in migratory bird populations (Chapters 4.2 and 4.3). Alternative 3 addresses these concerns but would still result in several years of reductions until objectives are met. We are also indirectly allowing the removal or killing of native predators such as wolves and coyotes to protect permittees livestock investments. This is an irretrievable but not irreversible commitment since predator populations can recover.

4.3.2 Potential Adverse Environmental Effects that Can Not be Avoided (40CFR 1502.16)

Chapters 3 and 4 address the potential environmental consequences of three alternatives for livestock grazing. All the alternatives would result in some adverse environmental effects. Alternative 1 would result in economic hardships on permittees because of lost forage for livestock. Removing fences and water developments under this Alternative would result in short-term minor effects associated with removing these structures. Alternative 2 would contribute numerous adverse effects related to vegetation, stream form and function, and migratory birds compared to the other Alternatives. Alternative 3 would also result adverse effects but to a lesser extent. One exception might be the increase in costs to the permittee to meet bank alteration standards and to construct a number of proposed improvements.

4.3.3 Short-term Use vs. Maintenance and Enhancement of Log-term Productivity (40 CFR 1502.16)

Livestock grazing is done on a sustainable basis. Grazing is supposed to utilize forage that would otherwise go “unused” and be recycled into the soils. This can be done on a sustainable basis if plants are allowed adequate time to recover. All the Alternatives consider the long-term maintenance of forage resources, clean water and the general health of landscapes in the Bangtail Mountains. Alternatives 2 and 3 would both utilize forage on a sustainable basis. However, Alternative 3 would result in improved conditions overall across the landscape. Both the action Alternatives meet the requirements described in the Forest Plan and other laws and regulations that relate to land productivity.

4.3.4 Energy Requirements

None of the Alternatives would use excessive amounts of energy to implement. Alternative 3 would use slightly more energy that either Alternatives 1 or 2. This is because of the increased amount of administration related to this Alternative and the amount of energy needed to construct the proposed improvements. However, the amount of energy used would not create any kind of economic or social impact on the local communities. Resources used to implement any of the Alternatives are very minor compared to other local energy consumptions.

4.3.5 Environmental Justice

Executive order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations", directs federal agencies to integrate environmental justice considerations into federal programs and activities. Environmental justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment (E.O. 12898 and Departmental Regulation 5600-2).

The Forest Service has provided notice of comment opportunities and has considered all public input from persons or groups regardless of age, race, income status, or other social/economic characteristics (Project File, Scoping). There would be no adverse effects to human health and no alternative has been determined to disproportionately affect minority or low income populations.

4.3.6 Review of Regulations, Policies, Forest Plan Direction and Disclosures of Potential Conflicts with Plans and Polices of other Jurisdictions [40 CFR 1502.16(c)]

The ID Team reviewed each alternative's compliance with items related to the Forest Plan, Forest Service regulations and policies and State and Federal laws. Table 4.8 summarizes those items and highlights where an alternative did not comply or marginally complied with direction.

Table 4.8. Forest Plan, Law and Regulation Compliance Check. This table reviews compliance with Forest Plan requirements, and laws and regulations that apply to this proposal.

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
Desired Future Conditions at end of the First decade: (Forest Plan Chapter II-12, 13)			
Livestock grazing is expected to increase slightly in the first decade. This increase will be accomplished through more intensive management on existing allotments and possible initiation of stocking on a few new allotments. This increase could be from 43,000 AUMs to 44, 900 AUMs and will be accomplished to protect or enhance other resource values.	No	No	Yes
Reasons: The Forest Plan goal of slightly increasing the AUMs would not be met. None of the Alternatives proposes even a slight increase in AUMs and Alternative 1 would reduce AUMs. Under Alternative 3 there might be a chance that AUMs could increase if management actions indicate that an increase would contribute toward improving the overall environmental health of an area. However, no increase is proposed at this time.			

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
Improved range management practices will be initiated to improve wildlife habitat in livestock grazing allotments on wildlife winter range and riparian areas.	Yes	No	Yes
Reasons: Alternative 2 is not proactive in recovery of habitat in riparian areas. None of the alternatives were determined to have a positive or negative effect on winter range.			
Applicable Forest-wide goals (Forest Plan Chapter II-1, 2)			
Meet or Exceed Montana Water Quality Standards	Yes	Yes	Yes
Reasons: All the alternatives meet Montana water quality standards (Chapters 2.3 and 3.2).			
Maintain and enhance fish habitat to provide for an increased fish population	Yes	No	Yes
Reasons: Alternative 2 does not improve stream form and function in degraded reaches of streams having Yellowstone cutthroat trout.			
Provide habitat for viable populations of all indigenous wildlife species and for increasing populations of big game.	Yes	Yes	Yes
Reasons: The discussions in Chapter 2.3 and 4.2.2 indicate indigenous populations would be maintained or enhanced. There would be either no affect or no adverse affects on T, E or S species.			
Maintain or improve the forage resource	Yes	Yes	Yes
Reasons: All the alternatives at least meet the minimum requirements for maintaining range resources. Alterative 1 and 3 are better than 2.			
Provide for a small increase in livestock forage	No	No	Yes
Reasons: None of the Alternatives propose an increase in AUMs. Alternative 3 would at least provide the opportunity to increase AUMs if monitoring indicates it would result in improved environmental conditions but no increase is foreseeable at this point.			
Manage National Forest resources to prevent or reduce serious long lasting hazards from pest organisms utilizing principles of integrated pest management.	Yes	Yes	Yes
Reasons: An aggressive weed treatment program is implemented regardless of the alternative.			
Applicable forest wide objectives (Forest Plan Chapter II-4,5)			
Fish habitat will be managed by application of “best management practices”. Management standards have been set to mitigate impacts occurring to the fishery resource from land use activities	Yes	Yes	Yes
Reasons: Best management practices are followed regardless of the alternative			
Management of livestock will consider utilization levels in riparian zones	Yes	Yes	Yes
Reasons: Alternatives 1 would contribute most to restoration. Alternative 3 is more			

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
aggressive than Alternative 2 and implements bank alteration standards along with utilization standards. Alternative 2 only has utilization guidelines.			
Improved forage management will be used to maintain or enhance the range environment and to provide for increased AUMs	Marginal	Marginal	Marginal
Reasons: None of the Alternatives provide for an increase in AUMs. Alternative 1 would most likely improve upland and riparian conditions by removing livestock. Alternative 3 would at least provide the opportunity to increase AUMs if monitoring indicates it would result in improved environmental conditions but no increase is foreseeable at this point. Alternative 3 is also expected to improve upland and riparian conditions.			
The Forest Plan calls for continuing to administer about 15,000 AUMs of grazing use on private lands that are intermingled with National Forest lands within grazing allotments	No	Yes	Yes
Reasons: Alternative 1 does not support this Forest Plan objective of continuing to graze a certain amount of AUMs Forest-wide.			
Watersheds will be managed by application of "best management practices". Management standards have been set to mitigate impacts occurring to the watershed resource from land use activities	Yes	Yes	Yes
Reasons: Best management practices are followed regardless of the alternative			
Applicable forest wide Standards (Forest Plan Chapter II-14-29)			
Emphasis will be given to the management of special and unique wildlife habitats such as wallows, licks, talus, cliffs, caves, and riparian areas.	Yes	Marginal	Yes
Alternative 2 does not meet this Forest Plan standard was well as alternatives 1 and 3 because it does not recover riparian areas.			
Applicable forest wide Standards cont'd (Forest Plan Chapter II-14-29)			
Habitat that is essential for species identified in the Sensitive Species list developed for the Northern Region will be managed to maintain these species. These species include: Trumpeter Swan, Westslope and Yellowstone Cutthroat trout, Western Big Eared Bat, Spotted Bat, Ferruginous Hawk, Harlequin Duck, Boreal Owl, and Common Loon.	Yes	No	Yes
Alternative 2 does not provide recovery for those reaches of streams that are non-functioning, functioning at risk or that currently do not meet the Forest Plan Standard for stream channel stability of no more than a 20 point departure.			
The Forest will be managed to maintain and, where feasible, improve fish habitat	Yes	Marginal	Yes

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
capacity in order to achieve cooperative goals with the Montana Department of Fish, Wildlife, and Parks and to comply with State water quality standards.			
Reasons: Alternative 2 does not propose actions to recover non-functioning or functioning at risk streams. Some streams inhabited by Yellowstone cutthroat trout would not be recovered to a condition that is conducive to healthy trout populations.			
Allotments with continuous grazing during the growing period will be evaluated and alternative grazing systems will be applied.	Yes	Yes	Yes
Reasons: Although Alternative 2 has at least deferred grazing systems it does not provide the option of changing to rest rotation systems. Alternative 3 implements some changes immediately and provides the option to change systems depending upon recommendations of the Adaptive Management Implementation Team based on monitoring.			
Best management practices will be used on all Forest watersheds in the planning and implementation of project activities (FP Appendix C and planning records – "Watershed Management Guidelines for the Gallatin National Forest").	Yes	Yes	Yes
Reasons: All the alternatives are in compliance with water quality and grazing BMPs.			
Implement an integrated weed control program in cooperation with the State of Montana and County Weed Boards to confine present infestations and prevent establishing new areas of noxious weeds.	Yes	Yes	Yes
Reasons: The District works closely with the County Weed District participates in weed management areas and has an aggressive integrated weed management program.			
Integrated Pest Management, which uses chemical, biological, and mechanical methods, will be the principal control method. Spot herbicide treatment of identified weeds will be emphasized. Biological control methods will be considered as they become available.	Yes	Yes	Yes
Reasons: Reasons: The District works closely with the County Weed District participates in weed management areas and has an aggressive integrated weed management program.			
Funding for weed control on disturbed sites will be provided by the resource that causes the disturbance (Gallatin Forest Plan, Forest-wide Standard, page II-28).	Yes	Yes	Yes
Reasons: The Forest has taken an integrated approach to weed management that includes all resource management areas. Each project includes BMPs for weeds and all contribute financially to reducing and preventing weeds.			
Noxious weeds along roads and trails will be treated (Gallatin Forest Plan,	Yes	Yes	Yes

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
Forest-wide Standard, page II-27).			
Reasons: Roads and trails are recognized as chronic sources of weeds and are therefore a priority treatment. Most suppression is conducted in these areas regardless of the alternative.			
Forest Plan Management Area Specific Standards and Guidelines (FP page III-19 – 23)			
Management Area #7 – Riparian Areas:			
Livestock grazing in riparian areas will be controlled at levels of utilization listed in Management Area 7 (FP page III-20).	Yes	Yes	Yes
Reasons: All the alternatives the Management Area direction for Management Area 7. Alternatives 1 and 3 would likely exceed (improve upon) the standard.			
Maintain suitable habitats for those species of birds, mammals, and fish that totally or partially dependent upon riparian areas for their existence.	Yes	Marginal	Yes
Reasons: Alternative 2 does not propose to take actions to recover degraded riparian areas. Therefore, those sections of stream would not recover. Alternatives 1 and 3 are both expected to result in recovered riparian areas.			
Concentration of livestock will be kept at a level compatible with riparian zone-dependent resource needs through development of pasture systems and associated improvements.	Yes	Marginal	Yes
Reasons: Alternative 2 does not take actions to recover problem riparian areas; alternatives 1 and 3 do. Alternatives 2 and 3 both use deferred grazing systems, improvements, herding, and mineral placements to reduce riparian use.			
Manage riparian vegetation, including overstory tree cover, to maintain streambank stability and promote filtering of overland flows.	Yes	Marginal	Yes
Reasons: Alternative 2 (No Action) is less aggressive in managing riparian areas and does not have the flexibility under adaptive management to change grazing strategies like Alternative 3. Since Alternative 1 would remove livestock it would do the most to vegetative cover and streambank stability.			
The Forest plan monitoring requirements (Forest Plan Table IV-1) monitoring item 5 lists two guidelines and standards which relate to limits of cumulative allowable management caused change to sediment filtration i.e. "more than a 25 % loss in effective streambank cover" and stream channel stability i.e. a "20 point increase in	Yes	Marginal	Yes

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
stream channel score within 5 years due to management practices".			
Reasons: Alternative 2 (No Change) does not take actions to alleviate concentrated livestock use in riparian areas. Strategies currently used are not successful in some areas.			
Laws, Policies and Forest Service Regulations			
Migratory Bird Treaty Act	Yes	Yes but less	Yes
Reasons: Alternative 2 does not improve degraded riparian areas.			
EO 13186 Migratory Bird Protection	Yes	Yes but less	Yes
Reasons: This Executive Orders requires the restoration and enhancement of the habitat of migratory birds as is practicable. Alternative 2 is not proactive in this respect.			
Forest Service Manual Section (FSM) 2670	Yes	Yes but less	Yes
Reasons: FSM 2670 directs us to avoid or minimize impacts to sensitive species and to coordinate with interested State and federal agencies, groups and individuals concerned with conservation of the species. Towards this end, the Yellowstone cutthroat trout Memorandum of Understanding and Conservation Agreement was developed and specifies actions to minimize impacts and achieve interagency objectives. All the alternatives implement strategies to recover Yellowstone cutthroat trout by deferred grazing strategies in Yellowstone cutthroat trout populations in Willow and Bangtail Creeks. Alternative 2 does not go as far as the other alternatives since it would not make trampling standards a permanent part of the Allotment Management Plans.			
Presidential Executive Order 12962: Federal agencies shall,….improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities	Yes	Yes but less	Yes
Reasons: Alternative 2 does not improve degraded riparian areas			
Clean Water Act and Montana Water Quality Act	Yes	Yes	Yes
Reasons: As stated in Chapter 2.3 and 3.2 all the activities are currently in compliance with the Clean Water Act.			
Implementation Strategy for the 1999 Westslope Cutthroat Trout Conservation Agreement/MOU within the Upper Missouri River Basin	Yes	Yes	Yes
Reasons: Chapter 3.2 documents the strategy has been adopted by the Forest and would be followed regardless of the alternative selected.			
Forest Service Manual 2259.03: "Forest office shall cooperate fully with State, County and Federal officials in implementing 36 CFR 222.8 and sections 1 and 2 of PL 90-583 (see below). Within budgetary constraints,	Yes	Yes	Yes

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
the Forest Service shall control to the extent practical, noxious farm weeds on all National Forest System lands."			
Reasons: All the alternatives follow an aggressive integrated weed management program.			
Forest Service Manual 2080: In consultation with Federal, State, and local government entities and the public, develop and implement a program for noxious weed management on National Forest System lands. Activities implementing the noxious weed management program must be consistent with the goals and objectives identified in Forest Land and Resource Management Plans (FSM 1910, 1920, and 1930).	Yes	Yes	Yes
Reasons: All the alternatives follow an aggressive integrated weed management program and are in compliance with the Forest Plan.			
Executive Order 13112: Invasive Species, February 3, 1999. This order directs Federal Agencies whose actions may affect the status of invasive species to (l) prevent the introduction of invasive species (ii) detect and respond rapidly to, and control, populations of such species in a cost-effective and environmentally sound manner, as appropriations allow.	Yes	Yes	Yes
Reasons: All the alternatives follow and aggressive integrated weed management program. The proposal incorporates by reference the analysis and findings documented in the Gallatin Noxious and Invasive Weed EIS and decisions in the Record of Decision (2005)			
36 CFR Sub A, Sec 222.8: "… The chief, of the Forest Service, will cooperate with County or other local weed control Districts in analyzing noxious farm weed problems and developing control programs in areas which the National Forest and National Grasslands are a part."	Yes	Yes	Yes
Reasons: Regardless of the alternative the Forest cooperates to the fullest extent with counties.			
Federal Noxious Weed Act of 1974 (sec 9): Authorized the Secretary to	Yes	Yes	Yes

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
cooperate with other Federal and State agencies or political subdivisions thereof, and individuals in carrying out measures to eradicate, suppress, control or prevent the spread of noxious weeds. The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.			
Reasons: Regardless of the alternative the Forest would meet the legal requirements of this Act.			
Carlson-Foley Act, October 17, 1968 (Public Law 90-583): Authorized and directs heads of Federal Departments and Agencies to permit control of noxious plants by State and local governments on a reimbursement basis in connection with similar and acceptable weed control programs being carried out on adjacent non-Federal land.	Yes	Yes	Yes
Reasons: The Forest provides money through grants to local government to control weeds. Grants through the Greater Yellowstone Coordinating Committee are an example. The Act allows Federal funds to be used to controls weeds off Forest.			
Federal Land Policy and Management Act of 1976 (Public Law 94-579): This act provides authority to control weeds on rangelands as part of a rangeland improvement program.	Yes	Yes	Yes
Reasons: All alternatives propose to follow an aggressive weed control program.			
National Forest Management Act of 1976 (Public Law 94-588): This act provides authority for removal of deleterious plant growth and undergrowth and provides for expenditures of funds to serve as a catalyst to encourage better management of private forests and rangelands.	Yes	Yes	Yes
Reasons: All alternatives propose to follow an aggressive weed control program.			

Applicable Forest Plan Desired Future Conditions, Goals, Objectives, Standards or Guidelines, Laws Regulations or Polices	**Compliance – Yes or No**		
	Alternative 1	**Alternative 2**	**Alternative 3**
The State of Montana County Noxious Weed Management Act (MCA 7-22-2101): This act provides for designation of noxious weeds within the State and directs control efforts. Provisions are made for registration of pesticides, licensing of distributors and applicators, and enforcement of State statutes. An enforcement responsibility for the control of noxious weeds within Montana is delegated to County Commissioners through Weed Management District Boards. In Montana, the Montana County Noxious Weed Management Act states that it is unlawful for any person to allow noxious weeds to propagate or go to seed on their land unless they have an approved weed management plan. This act directs counties to develop weed control plans and implement weed control efforts.	Yes	Yes	Yes
Reasons: All plans and programs are in place on the Forest to be in complete compliance with the Montana County Noxious Weed Management Act. All alternatives comply.			
Montana Weed Management Plan (2008): Strengthen, support, and coordinate private, county, state, and federal weed management efforts in the state, and promote implementation of ecologically-based integrated weed management programs.	Yes	Yes	Yes
Reasons: All alternatives comply			

CHAPTER 5.0 PREPARERS AND PERSONS AND AGENCIES CONTACTED

5.1 List of Persons Conducting the Analysis and Preparing the Document

John Councilman……Interdisciplinary Team Leader
Beverly Dixon……District Wildlife Biologist
Bruce Roberts……West Zone Fisheries Biologist
Tom Keck……...Gallatin Forest Soil Scientist
Mark Story……..……Gallatin Forest Hydrologist
Reggie Clark……..District Rangeland Management Specialist

5.2 List of Agencies, Organizations, and Persons Contacted During Scoping

Sky Anderson
Gregory and Anne Avis
Dan Brelsford
Leola Brelsford
Richard Brelsford
Terry and Beth Corbin
Christopher and Michele Evans
Jessi and Jaimi Faris
Marie Flatt
Gartzmann Gould II
Christine Lane Dombois
Preston Link
Jean MacInnes
Eric & Cynthia Magi
Shirley Morton
Jerry Nicholson
Dale and Becky Oberly
Robert and Mary Ellen Wiseman
Alliance for the Wild Rockies
American Fisheries Society
American Wildlands
Bozeman Daily Chronicle
Bureau of Land Management
Chamber of Commerce
Christie Family Trust
Salish & Kootenai Tribal Preservation
Gallatin County Extension Agent
Crow Tribe of Indians
Defenders of Wildlife
Gallatin County Commissioners
Gallatin Wildlife Association
Greater Yellowstone Coalition
Cliff Ham
John Ham
Harms Livestock
Headwaters Chapter FFF
Headwaters Group
Keystone Conservation
Barry Klein %Dave Poncin
Leffingwell Ranch
Madison-Gallatin Chapter TU
Harry Marinow Trustee
Milesnick Ranch Inc
Sacajawea Audubon Society
Montana DNRC
MT Environmental Information Center
Montana Fish Wildlife & Parks
Montana Stockgrowers Association
Montana Wilderness Assn
Montana Wildlife Federation
Montana DEQ
National Wildlife Federation
Native Ecosystem Council
Native Forest Network
Park Conservation District
People for the West
Rep Dennis Rehberg
RF Bar Ranch

Senator Max Baucus
Shoshone-Bannock Tribes
Southern Pine Plantations
Taylor Trust
TU Joe Brooks Chapter
TU Madison-Gallatin Chapter
US Environmental Protection Agency
US Fish and Wildlife Service
Western Watersheds Project
Wild Earth Guardians
Wild West Institute
Wilderness Society
Yanke Family Trust
YT Timber Inc

5.3 List of Agencies, Organizations, and Persons Notified that the Environmental Assessment was Available for a 30 Day Comment Period

Tad Weaver
Alliance for the Wild Rockies
American Wildlands
Defenders of Wildlife
Gallatin Wildlife Association
Greater Yellowstone Coalition
Cliff Ham
John Ham
Harms Livestock
Headwaters Chapter FFF
Keystone Conservation
Barry Klein %Dave Poncin
Leffingwell Ranch
Montana Fish Wildlife & Parks, Scott Opitz
Montana Fish Wildlife & Parks, Pat Flowers
Montana Wildlife Federation
Montana DEQ
National Wildlife Federation
Native Ecosystem Council
Native Forest Network
RF Bar Ranch
Southern Pine Plantations
US Environmental Protection Agency
Western Watersheds Project
YT Timber Inc

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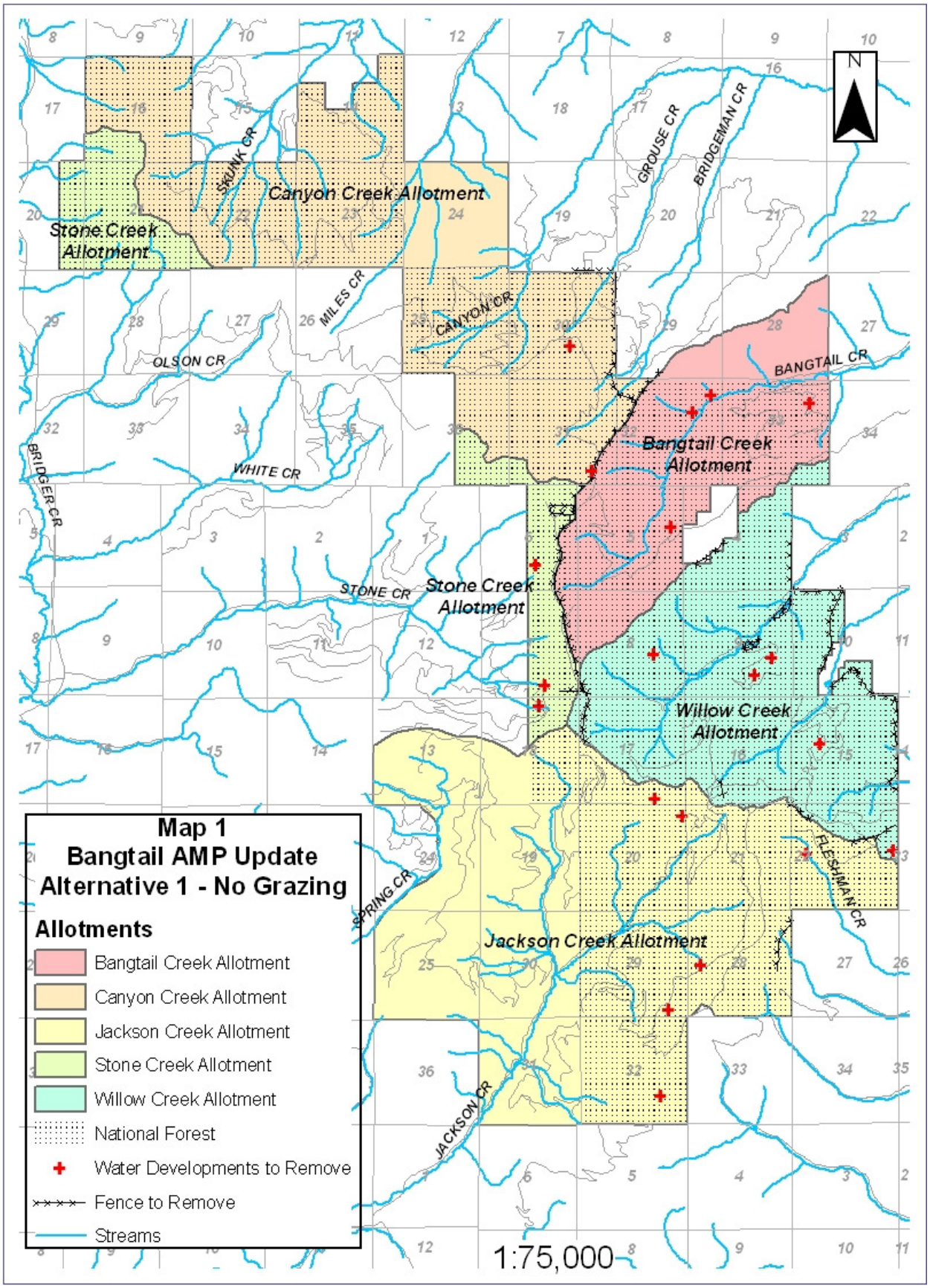
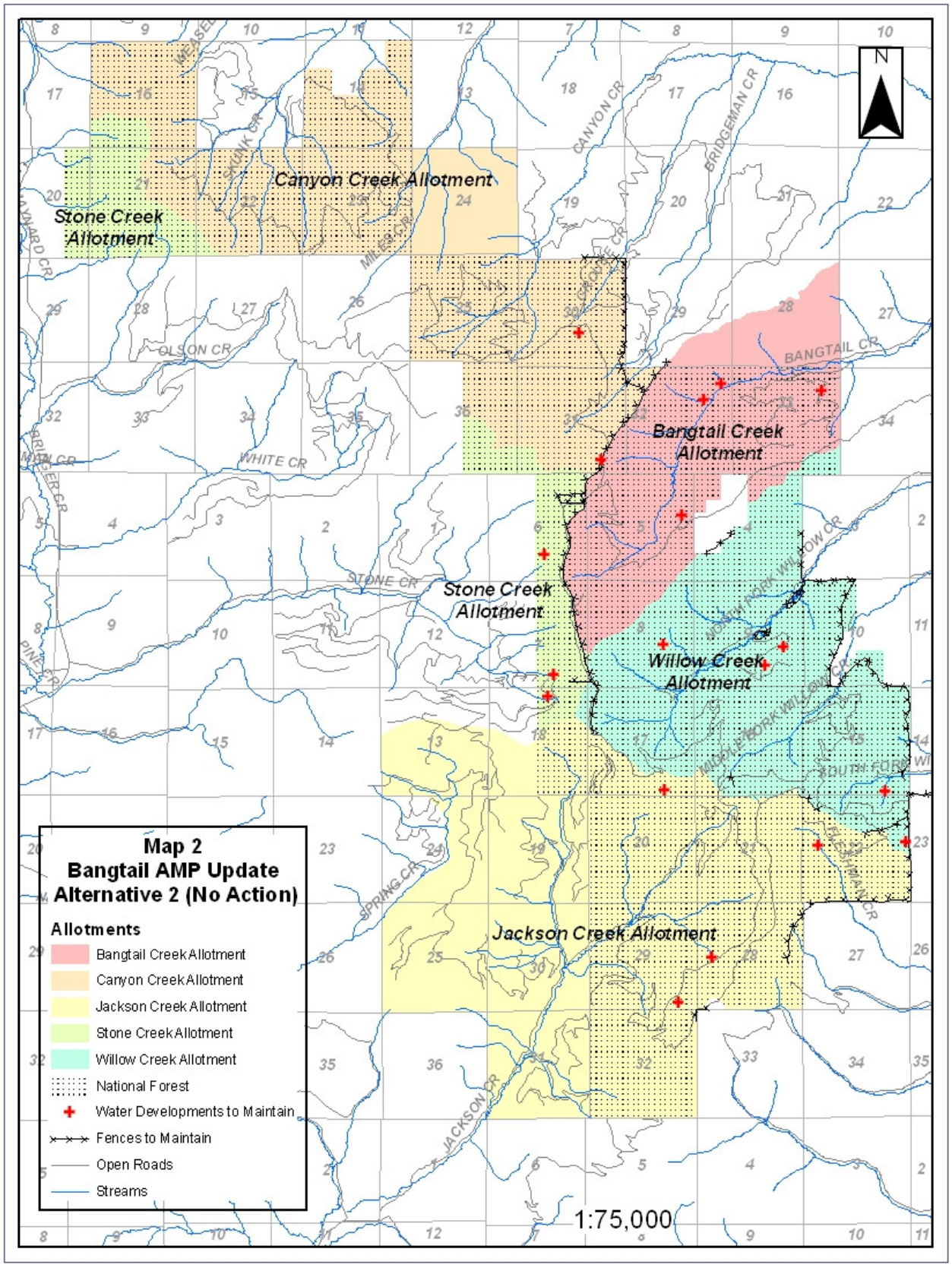
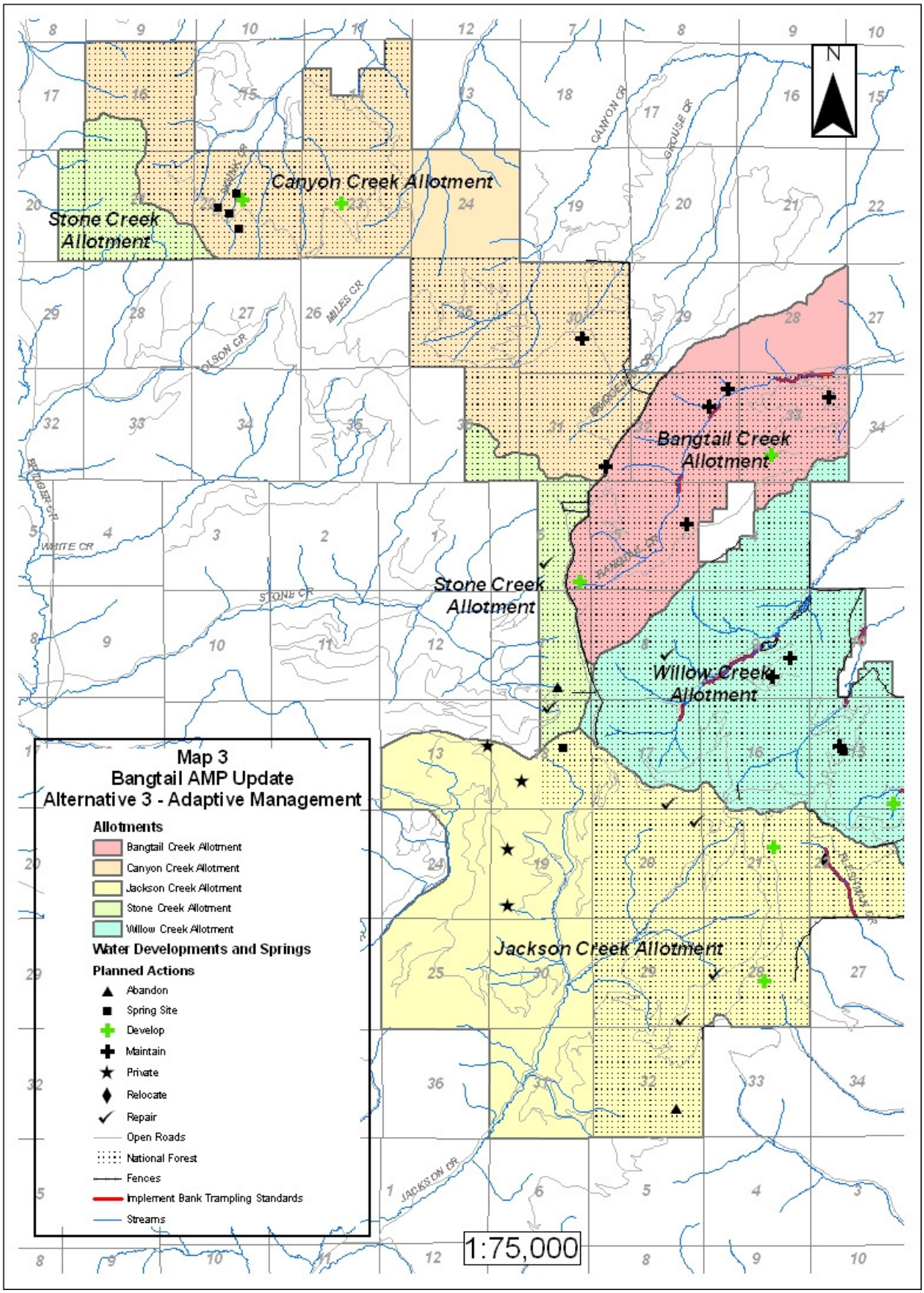
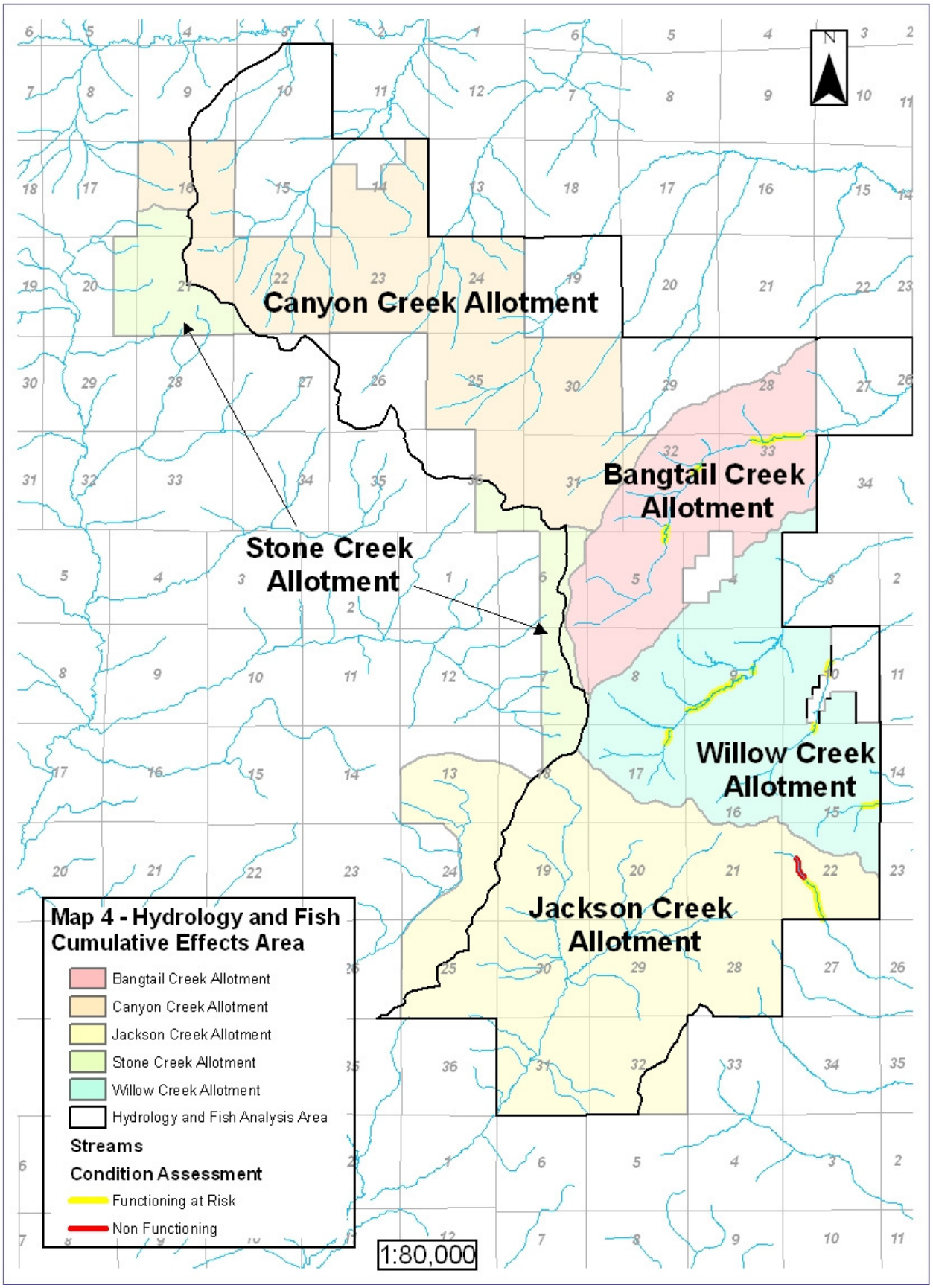
Appendices for Bangtail Allotment Management Plan Environmental Assessment

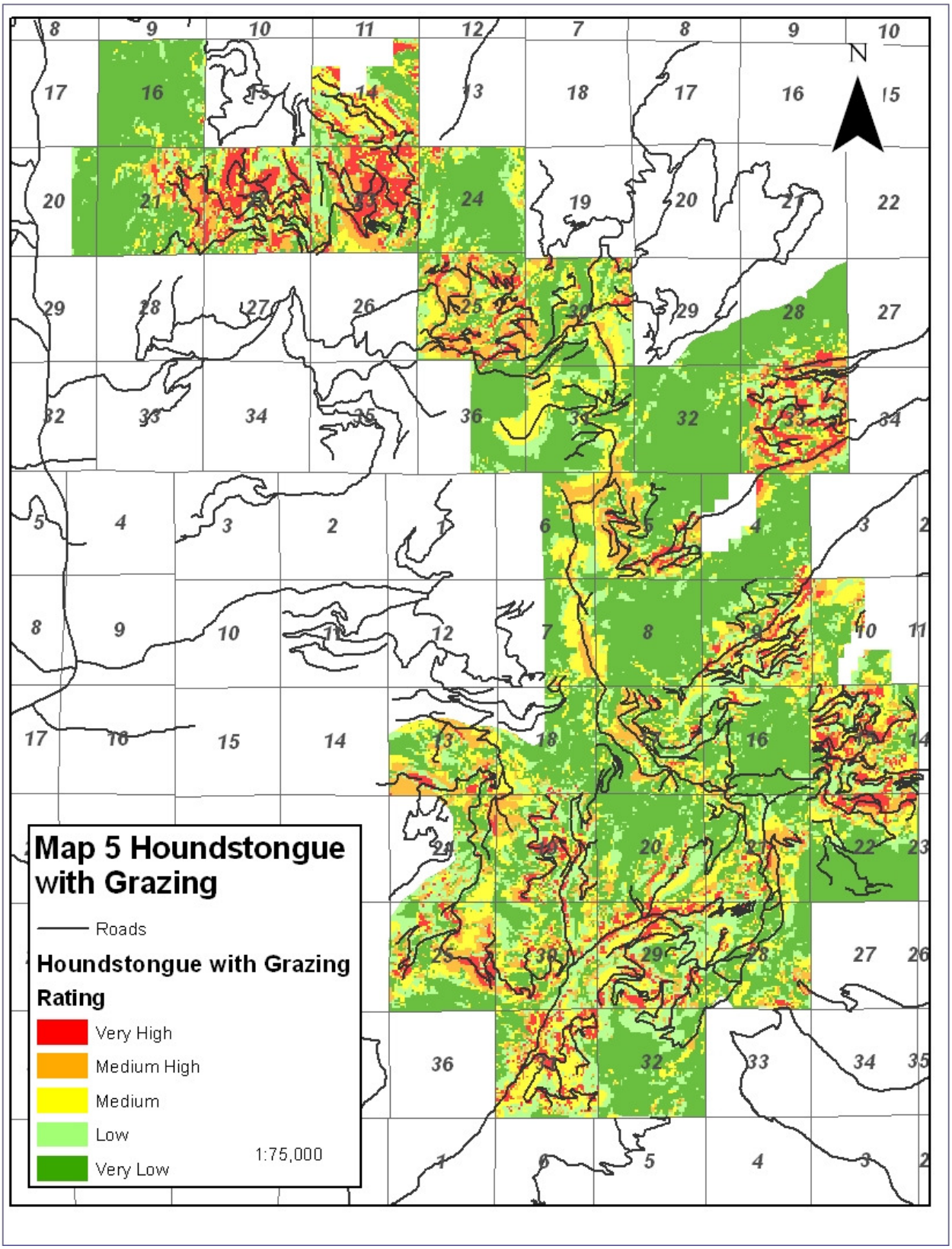
Appendix 1 – Maps

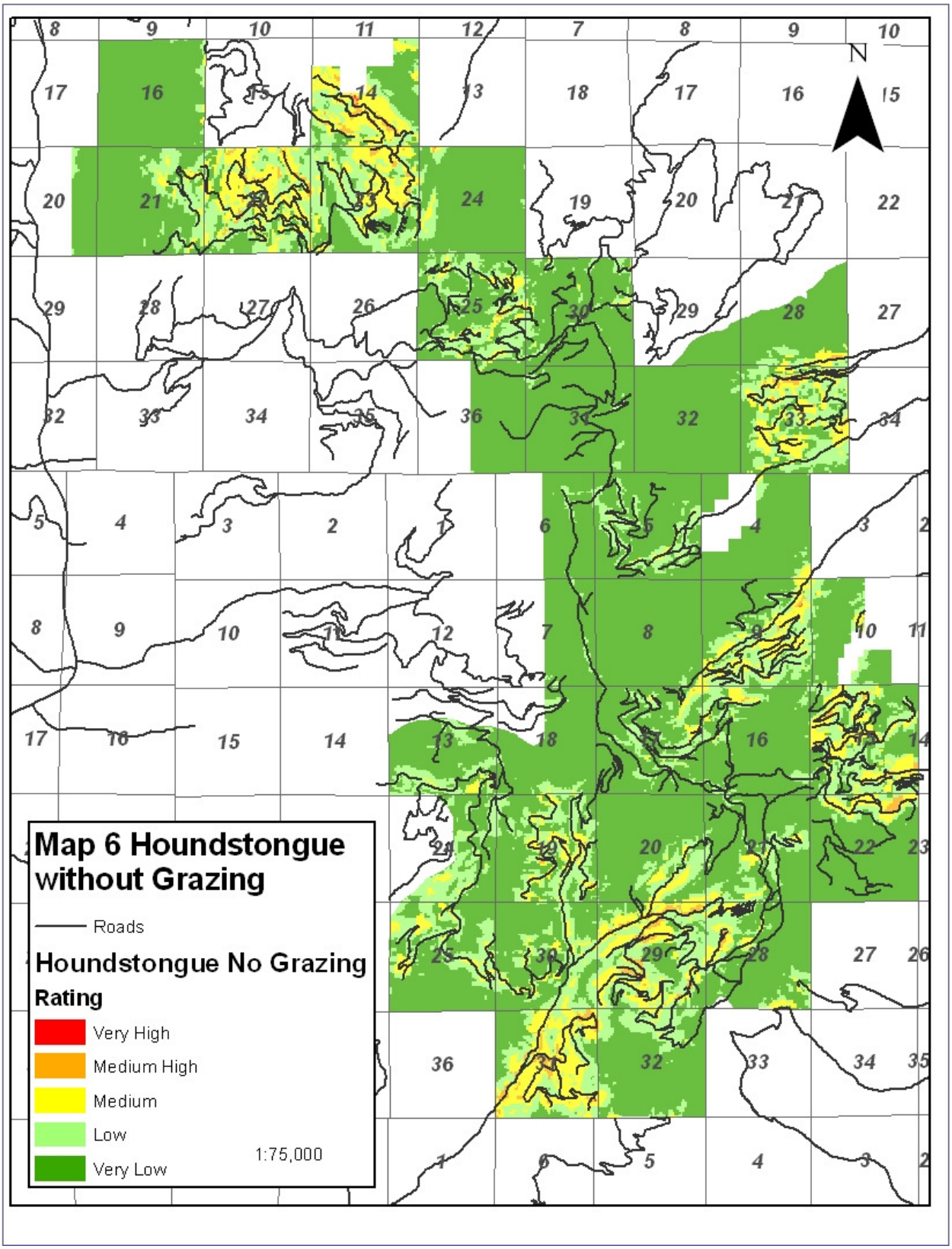

N
Canyon Creek Allotment
Stone Creek Allotment
Bangtail Creek Allotment
Stone Creek Allotment
Willow Creek Allotment
Jackson Creek Allotment
SKUNK CR
MILES CR
CANYON CR
OLSON CR
GROUSE CR
BRIDGEMAN CR
BANGTAIL CR
WHITE CR
BRIDGER CR
STONE CR
SPRING CR
FLESHMAN CR
JACKSON CR
Map 1
Bangtail AMP Update
Alternative 1 - No Grazing
Allotments
Bangtail Creek Allotment
Canyon Creek Allotment
Jackson Creek Allotment
Stone Creek Allotment
Willow Creek Allotment
National Forest
Water Developments to Remove
Fence to Remove
Streams
1:75,000


Canyon Creek Allotment
Stone Creek Allotment
Bangtail Creek Allotment
Stone Creek Allotment
Willow Creek Allotment
Jackson Creek Allotment
CANYON CR
BRIDGEMAN CR
BANGTAIL CR
OLSON CR
WHITE CR
STONE CR
SPRING CR
JACKSON CR
N
Map 2
Bangtail AMP Update
Alternative 2 (No Action)
Allotments
Bangtail Creek Allotment
Canyon Creek Allotment
Jackson Creek Allotment
Stone Creek Allotment
Willow Creek Allotment
National Forest
Water Developments to Maintain
Fences to Maintain
Open Roads
Streams
1:75,000


N
Canyon Creek Allotment
Stone Creek Allotment
Bangtail Creek Allotment
Stone Creek Allotment
Willow Creek Allotment
Jackson Creek Allotment
CANYON CR
GROUSE CR
MILES CR
OLSON CR
BRUSH CR
WHITE CR
STONE CR
JACKSON CR
Map 3
Bangtail AMP Update
Alternative 3 - Adaptive Management
Allotments
Bangtail Creek Allotment
Canyon Creek Allotment
Jackson Creek Allotment
Stone Creek Allotment
Willow Creek Allotment
Water Developments and Springs
Planned Actions
Abandon
Spring Site
Develop
Maintain
Private
Relocate
Repair
Open Roads
National Forest
Fences
Implement Bank Trampling Standards
Streams
1:75,000


Canyon Creek Allotment
Bangtail Creek Allotment
Stone Creek Allotment
Willow Creek Allotment
Jackson Creek Allotment
N
Map 4 - Hydrology and Fish Cumulative Effects Area
Bangtail Creek Allotment
Canyon Creek Allotment
Jackson Creek Allotment
Stone Creek Allotment
Willow Creek Allotment
Hydrology and Fish Analysis Area
Streams
Condition Assessment
Functioning at Risk
Non Functioning
1:80,000


Map 5 Houndstongue with Grazing
Roads
Houndstongue with Grazing Rating
Very High
Medium High
Medium
Low
Very Low
1:75,000
N


Map 6 Houndstongue without Grazing
Roads
Houndstongue No Grazing
Rating
Very High
Medium High
Medium
Low
Very Low
1:75,000
N

Appendix 2 - Alternative 3 Management Actions

Bangtail AMP Update Descriptions of Management Actions Associated with Alternative 3

Descriptions of Management Actions: This section defines the Management Actions that might be implemented based on monitoring results. These descriptions list as many of the possible events that are associated each management action. These are listed for purpose of being included in the effects analysis. Each ID Team member has reviewed this list and is including the potential environmental effects of these actions.

Note: The exceptions to this are: B. Implement prescribed fires; D. Decommission roads; and, FF. Mechanical treatment that includes the commercial removal of forest products. These management actions would take additional environmental analysis and documentation. Also "V. Build or rebuild a fence" – there are only three fences that we know we are going to construct at this point. These would be included in the decision. Anything beyond this would require additional NEPA.

This section also documents our predictions for each management action. Part of adaptive management includes documenting our predictions about what we anticipate would happen if we implement an action. This serves a couple of purposes. One purpose is that we can compare what really happens to what we predicted would happen, the other purpose it that we want to implement activities that move us toward our target condition and our mission. Describing our predictions indicates whether a management action moves us in the right direction.

A. Construct exclosures: This includes fencing around sensitive sites such as along streams, springs, aspen stands that are regenerating or that getting too much use by ungulates. Fences would either be electric fence, four stand barbed wire, high tensile smooth wire, pole fence, and they may also be constructed to allow easier wildlife passage (Sonoma County Center 2006).

Predictions: We predict that by constructing an exclosure we would eliminate any detrimental effects that livestock are having on an area. We are also predicting that by eliminating livestock use we would promote recovery of the area within the exclosure.

Environmental activities associated with this action: Activities similar to fence construction (**V. Build or rebuild a fence**) would be associated with construction of exclosures. Fences would generally be constructed to allow the use of the enclosed area by wildlife. The exception to this would be fences around aspen stands which would exclude all ungulates and electric fences which could exclude use by wildlife. Small exclosures of less than 10 acres using wildlife friendly fence would not require further environmental analysis, documentation or disclosure. These areas would undergo a site-specific review for heritage resources and sensitive plants prior to implementation.

B. Implement prescribed fires: Prescribed fires would be implemented to reduce conifer encroachment caused by livestock grazing (Belsky and Blumenthal 1997) or from fire exclusion (Gruell 1983). They may also be implemented to regenerate disturbance dependant plant communities such as aspen. Prescribed burning may be used to reduce sagebrush and invasive species such as noxious weeds or non-native grasses.

Predictions: Burning is expected to result in the removal of conifers that have become established either because of fire exclusion or from a combination of fire exclusion and livestock grazing. We are predicting that removing conifers would provide better distribution of livestock, lighter utilization of available forage, and/or perpetuate vegetation that historically occupied those sites.

Environmental activities associated with this action: The environmental activities of prescribed burning would be evaluated in a separate environmental analysis. There are no proposed prescribed fires proposed under this action.

C. Change grazing systems: Grazing systems include rotation strategies that rest pastures for certain lengths of time, varying allotment entry dates, places of entry or the intensity grazing.

Predictions: Grazing system changes can provide vegetation the opportunity to recover from each cycle of grazing. It may also reduce other problems such as soil compaction or creating areas of heavy use (BLM 1998).

Environmental activities associated with this action: Changing the pattern, timing and duration of grazing on some or all of the pastures of an allotment.

D. Decommission roads: Decommissioning roads would be completed to reduce sediment contributed to area streams. Roads that would be decommissioned would follow the Gallatin Travel Plan. Roads typically decommissioned are not needed for access. Actual road decommissioning would be implemented under a separate environmental analysis.

Predictions: We know that roads cause around 70 percent of sediment in streams. If sources of sediment associated with roads were removed then we predict a high percentage of the sediment now in streams would eventually be transported downstream. This would improve stream conditions in the project area and lead to proper functioning conditions.

Environmental activities associated with this action: Activities affecting the environment associated with road decommissioning would be evaluated in a separate environmental analysis.

E. Road maintenance: Road maintenance can be followed up on immediately to reduce erosion into streams. However, it is standard Forest procedure to put roads on a maintenance schedule although some roads may need to be maintained more frequently. Therefore, as maintenance problems arise, the maintenance schedule can be changed to address specific problem areas.

Predictions: We know that poorly maintained roads contribute more sediment than properly maintained roads. We are predicting that properly maintained roads contribute less sediment and if we keep up on the maintenance this would reduce sediment in streams.

Environmental activities associated with this action: Forest Service Handbook 1909.15 categorically excludes maintenance from documentation in a decision memo, environmental assessment or EIS. This action would take place at any time but is usually done on a schedule. It is understood that the environmental effects of activities associated with road maintenance would be cumulative to the other activities that could be implemented under adaptive management.

F. Create or reconfigure pastures: Pastures can be reconfigured to exclude sensitive areas and alter the timing and intensity of how vegetation is grazed. New pastures can be created to generate better control of grazing. For example, livestock can be moved to a new pasture when one has met the standards for

utilization, bank trampling, etc. This action would often require construction of fences or moving fences to create or reconfigure pastures.

Predictions: We predict this management action would improve plant health in general but also improve the representation and competitiveness of native plants. We think non-native plants would decrease in number and area that they occupy.

Environmental activities associated with this action: Many of the same effects of fence construction would occur (**V. Build or rebuild a fence**). Livestock would be controlled either more intensely, under a situation where pastures are added, or less intensely if pasture numbers are decreased. More control might include more frequent movement of livestock to other pastures, movement of mineral supplements, etc. More intensive management would require permittees to ride the allotment on a frequent basis and herd the livestock into areas to achieve more uniform utilization.

G. Change the class of livestock: This means switching from cow calf pairs to yearlings or vise versa or to cows without calves.

Predictions: We are predicting that changing the class of livestock would alter how the pastures are grazed. Because yearlings only graze an allotment for a short time, they may not have a chance to really find where all the grazing areas area, or the locations of the mineral supplements. We think this would influence utilization, riparian grazing, etc.

Environmental activities associated with this action: Changing the class of livestock can alter how the rangelands are used. Typically, cows having grazed an allotment for several years learn where the best places are to graze. Yearlings are new to the allotment so they don't know where preferred areas are located or where the mineral supplements are located. This may cause some changes in the distribution of livestock. Yearlings may also be more vulnerable to predators and poisoning from larkspur.

H. Combine some or all allotments: Sometimes it may make better sense to combine allotments to provide more flexibility in how the livestock utilize the rangelands. For instance, allotments could be used as pastures.

Predictions: The incentive for combining allotments would be to improve plant health and provide more flexibility in timing and duration of grazing. We predict this would happen.

Environmental activities associated with this action: Two allotments could be combined into one to create separate pastures. Cattle from two or more allotments could be combined. Coordination between permittees would occur. Mixing of livestock would occur that could pass diseases, and mix genetics. Mixing would also require that livestock be separated at the end of the grazing season.

I. Change livestock numbers, non use, or removal for resource protection: Livestock numbers can be increased or decreased depending upon the vegetation objectives. There may be some years when drought or wildfire would require temporary reductions in livestock numbers. Complete removal for a period of years might occur in some situations. This can be discussed with permittees prior to implementation and would be done with a permit modification in the annual operating plan. Attempts would be made to negotiate agreeable adjustments with permittees. Permittees may also choose to only partially graze or not graze at all for short periods as long as they meet the terms and conditions of their permit.

Predictions: Altering the number of domestic livestock should change utilization levels but not always. A few cows grazed a long time may have more impact that a lot of cows grazed for a short time.

Environmental activities associated with this action: Livestock would not be allowed to graze for a certain amount of time or a lesser number of livestock would be placed on the allotment. Temporary removal of livestock would include continued maintenance of all allotment improvements by the permittee.

J. Instream improvements: These include any type of work that would result in improved fish habitat.

Predictions: There are streams that have been degraded for a number of reasons. We think that placing instream improvements would improve habitat in the short and long term resulting in higher fish and amphibian populations.

Environmental activities associated with this action: Downed woody debris placement, placement of rock material would qualify as instream improvements. A Montana Stream Protection Act 124 permit may be required for these activities. This activity may include both the use of hand crews or small machinery. Chainsaw felling of live or dead vegetation would occur. Small excavators may be used outside of the stream to place materials such as rock or downed wood into streams. Skidding of debris down to the stream may occur with ATVs, horses or other methods such as power winches.

K. Implement updated upland grazing utilization standards: Upland grazing utilization guidelines limit the amount use that can occur on key range forage species or in key areas. Season-long grazing system utilization is measured on key areas. Deferred and rest-rotation systems utilization is measured as an average over the rangelands. Updating the standards would change the level of utilization allowed in the uplands. The change would be based on recommendations from the AMIT and could be increases or decreases in utilization.

Predictions: With proper administration by either the District or the permittee utilization guidelines tell us when to move the livestock. Overtime this should maintain and in many cases improve the health of native plants and plant communities in line with project objectives.

Environmental activities associated with this action: Instructions and on-site training are provided to the permittee. Monitoring of this management action would include walking, driving, riding horses, or use of ATVs to access the allotments.

L. Livestock predation reduction:

Methods for avoiding and reducing livestock losses take two primary forms involving control or preventive action. These are described below as Option A and Option B respectively.

Option A: This action is represented by control of depredating large carnivores. As such, this option involves USDA Wildlife Services in cooperation with Montana Department of Fish, Wildlife and Parks and the USDA Forest Service. At the request of the permittee, Wildlife Services, in conjunction with appropriate federal and/or state wildlife management agencies, may investigate a reported livestock depredation by large carnivores. In the event that an attack or loss is investigated promptly and is confirmed by a knowledgeable agent, a control action may be authorized by the permitting agency. The objective of removal is to reduce livestock losses and the associated economic impacts to the permittee.

Environmental activities associated with this action: Control actions may include aerial hunting, aerial darting, aerial net gunning, cable foot snares, neck snares, steel traps, dogs and ground shooting. Damage control would target individual animals or local populations (coyotes or wolves) that are causing damage to legally present livestock on NFS lands.

Predictions: It is predicted that killing large carnivores would reduce predation on livestock (USFWS 1994b, 2002).

Option B: These actions represent efforts to prevent livestock depredations, and may involve cooperative efforts of state, federal, and non-government organizations.

At the request of the permittee (s), permitting agency or cooperators, entities may assist efforts to prevent large carnivore depredations on livestock. Preventive efforts may be proactive or reactive, and they may occur on public or private land. Such actions may involve removal of the offending animal(s) in conjunction with prevention methods in response to prior conflicts. Where depredations have yet to occur or conflicts are in early stages, proactive efforts may be more appropriate. In either case, the objective is to reduce livestock losses and the associated economic impacts to the permittee while conserving large carnivores as an integral part of natural ecosystems.

Environmental activities associated with this action: Under this option, prevention techniques could emphasize livestock husbandry practices including regular pregnancy testing, consistent timing of calving, leaving cows and yearlings unpolled, or running steers with cow/calf pairs, yearlings and/or replacement heifers. Additional techniques might include alternate grazing management practices such as using a more aggressive breed or class of livestock, changing grazing periods by altering turn-out and off-dates, increasing vigilance through more frequent and regular attendance, removal of attractants such as bone yards and carcass dumps, avoiding application of salt and mineral supplements in riparian areas or near other water sources, and scheduled changes in the timing and location of livestock when areas are known or expected to be used by native ungulates and/or carnivores. Moving livestock to alternate locations (pastures, allotments) or changing the timing of use (pasture rotation) may also be effective in reducing predator/livestock conflicts. Mechanical and/or electronic devices could also be used to deter predators. Examples include electronic devices for frightening predators and detecting carnivore movements, shock collars, electric fencing, fladry and less-than-lethal munitions.

Predictions: It is predicted that preventive efforts deployed at the appropriate scale of application, using appropriate methods and timing would reduce predation on livestock.

M. Control tall larkspur: Tall larkspur is a native species that is poisonous to cattle. Approval to control this species is approved under the Gallatin Noxious Weed EIS (2005). Cattle are more prone to poisoning early in the grazing season when larkspur is more abundant than grasses. Later in the season, leaf toxicity decreases but seed pod toxicity increases. Livestock producers generally wait until after larkspur flowers and adequate grass is present.

Predictions: Controlling tall larkspur would open up more area to grazing earlier in the spring with less risk to livestock. This would improve the utilization of non-native timothy grass and also provide more flexibility in grazing season, timing and duration of grazing.

Environmental activities associated with this action: The activities associated with application of herbicides are documented in the Gallatin National Forest Noxious and Invasive Weed EIS (2005). This project incorporated by reference the environmental activities and analysis completed for that project.

N. Change type of fencing: Different types of fencing could reduce maintenance. It could also reduce wildlife injury and facilitate wildlife movement. Examples of fences would be barbed wire, high tensile, electric, jack fence, let-down fence, suspension or pole fence.

Predictions: A more durable fence that needs less maintenance should, over the long-term, be less costly to the permittee to maintain and move affective at controlling livestock. A fence that is constructed to the right specifications would have less impact on wildlife.

Environmental activities associated with this action: All the activities associated with fence construction would apply to this management action although new fence posts may not be needed. Existing posts may be fitted with clips, rails or different kinds of wire. Wire may also be remounted to the post so that the fence can be let down after the grazing season to reduce snow damage or facilitate wildlife movement.

O. Harden stream crossings: Stream crossings would be hardened to reduce the amount of soil compaction and erosion into streams.

Predictions: Stream crossings are sources of sediment and the predictions are that if we harden the crossings then less sediment would end up in the stream. It is also predicted that the livestock would use and hardened crossing and not just find some way around it.

Environmental activities associated with this action: Small excavators may be used to move and place rock into the stream and along the streambank where livestock cross. Noise from operating machinery would occur along with some displacement of soil occurring to create a hardened crossing. Material would come from a weed-free source. These activities would require a Montana Stream Protection Act 124 permit and if wetlands are filled a 404 permit.

P. Change trailing routes: Trailing routes would be changed to reduce the amount of use in sensitive areas, reduce the number of stream crossings, etc. These changes would be implemented by opening up alternative trailing routes, fencing or other strategies.

Predictions: It is predicted that trailing routes can sometime be the source of problems and that moving a route would eliminate the problem.

Environmental activities associated with this action: Some removal of downed wood may occur to create a trailing route. Livestock would be herded along trailing routes concentrating the amount of livestock use along a very narrow area often only a few feet wide.

Q. Adjust salt and mineral placement: Moving salt and minerals around the allotment can dramatically change livestock use patterns. This strategy would be used to draw use away from sensitive sites such as riparian areas to more evenly distribute use.

Predictions: We know from research that moving salt and mineral supplements can have a large effect on the distribution of livestock over and allotment. We are predicting that if we try this tactic here we would have similar results, i.e. better utilization, healthier animals, etc.

Environmental activities associated with this action: Use of ATVs, pickup trucks, and horses would be needed to place salt and minerals at various points around the allotment. Livestock would concentrate their use of the area immediately around and adjacent to the salt and minerals. This would occur over extended periods of time each year and areas may be used year after year.

R. Noxious weed treatment: Noxious weed treatment would be completed to protect intact native plant communities, return native communities to their natural species composition, and to reduce the spread of weeds into un-infested areas.

Predictions: Noxious weeds would respond to a strategy of integrated weed management. It is predicted that at this point most weed species can be contained or controlled and that we can eventually return infested areas to native or near-native plant composition.

Environmental activities associated with this action: The Gallatin Noxious Weed EIS (2005) describes the types of activities that are associated with weed treatment. This would be an integrated noxious weed treatment strategy. All of these activities are expected to occur in this project. Weed sites would be put on a three year rotation where each sites is treated at least every third year.

S. Change grazing season: Timing of grazing would be changed so that livestock are grazing during a different stage of vegetative development.

Predictions: Changing the timing of grazing would affect the plant species that are grazed. Early season use would improve the utilization of non-native species such as timothy. Earlier seasons would reduce riparian use because temperatures are cooler and green forage in more prevalent in the uplands. Later grazing seasons would reduce soil compaction since soils are drier.

Environmental activities associated with this action: Livestock would be physically moved into an area at a time of year that is different than when the area was historically grazed.

T. Change allotment boundaries: This option would be implemented to facilitate administration, herding, forage utilization, economics, or grazing patterns.

Predictions: We are predicting that the end result would be improved rangeland and riparian conditions.

Environmental activities associated with this action: This may require additional or less fencing depending upon what the objectives are. If fencing is required then those activities are described under V, Build or rebuild a fence, would apply. Livestock may be herded in patterns that are different than what occur in the past. More or less herding may be needed.

U. Share permit administration with permittees: Having the permittee help with administration would have the permittee involved in monitoring methods and would provide the Forest Service feedback on how well management actions are working. This would get the permittees looking at the same monitoring indicators as the Forest Service.

Predictions: Sharing administration would improve management of the allotment by familiarizing the permittee with those items we monitor during our permit administration. We predict that the permittees would know better about when to move their livestock.

Environmental activities associated with this action: Field training would be provided to the permittee that describes what sharing administration includes. Physically visiting areas of the allotment would occur cooperatively by both the permittee and the Forest Service.

V. Build or rebuild a fence: A fence would be constructed or rebuilt to provide better control of livestock pasture use. It may be constructed or rebuilt to eliminate livestock trespass onto other allotments, or areas not in allotments. This management action also includes the installation of cattle guards. Cattle guards may be installed to replace gates. This is often done in places where gates are left open intentionally or unintentionally by the public. Cattle guards are also installed across roads and motorized trails.

Predictions: We are predicting that better control of the livestock results in better rangeland health.

Environmental activities associated with this action: Fence construction includes placing fence posts into the ground. Wooden fence posts would either be pounded into the ground with a tractor-mounted pounding machine or the post holes would be hand dug. If metal posts are used they would be pounded into the ground with a hand-operated pounder. The use of a tractor-mounted pounder requires the machine move along the area of fence construction and into and out of the area. This would create some soil disturbance. Also, it can be expected that some clearing of forest would occur to allow placement of the fences. This usually requires about a 10-12 foot area of clearing. The Installation of cattle guards requires heavy machinery and some excavation of soil. Noise and disturbance of the soil would result. Disturbed soil would be reseeded with a native weed-free seed mix.

Noise would also result from operation of the equipment. Construction could take several days and include the movement of personnel and vehicles into and out of the area each day.

W. Allow for adequate rest after prescribed or wildfire: This would be done for as long as it takes for the plants to recover enough to once again sustain grazing. This is typically two growing seasons but might only be one depending upon how well the vegetation is reestablishing itself.

Predictions: It is predicted that waiting until plants show enough vigor and growth so they can be grazed again would provide for long-term rangeland plant health.

Environmental activities associated with this action: Resting an area may cause grazing schedule changes with the permittee. Livestock may need to be either excluded from the area or moved to another allotment or pasture. This can change use patterns with other parts of the allotment. A temporary fence may also be erected.

X. Make use of unused grass banks: Vacant allotments or vacant pastures may be available to approved permittees when their normal allotment is not available. This situation may occur after a wildfire or for other resource concerns, such as drought.

Predictions: Using grass banks can allow some other place to be rested. This can allow plant recovery and eventually provide for better overall plant health.

Environmental activities associated with this action: Using grass banks would place livestock on areas that may not have been grazed for extended periods of time. Updating fences and improving water developments could be expected to occur prior to livestock moving onto the area.

Y. Suspension of grazing permit: Continued non-compliance with the terms of the grazing permit, or illegal activity, would result in action against the grazing permit which could result in the suspension or cancellation of the permit.

Predictions: We are predicting that suspension would put an end to these types of problems.

Environmental activities associated with this action: Removal of the permitted livestock from the allotment. A new permittee may be issued the suspended permit or the area may be left ungrazed or used as a grass bank when needed.

Z. Bill permittee for unauthorized use: Permittees may be billed if cattle are on allotments after the dates specified in the annual operating plan or with more numbers than are permitted.

Predictions: We predict that the monetary hardship caused by having to pay a penalty would cause the permittee to not repeat the unauthorized use.

Environmental activities associated with this action: No direct environmental activities are associated with this management action.

AA. Change the type of livestock: Examples of this would be a change from cattle to sheep or cattle to bison. The objective could be to improve plant community composition, reduce riparian use or reduce predation on livestock.

Predictions: Changing the type of livestock would change use patterns and the species of vegetation that are grazed. This could lead to better rangeland health.

Environmental activities associated with this action: Besides physically changing the type of livestock other management activities would occur. For example, changing from cattle to bison would require completely different fencing across the entire allotment. Therefore, activities associated with "V. Build or rebuild a fence" would apply is this case. In other cases, such as changing from cattle to sheep, less fencing may be required and therefore the activities related to "GG." Pick up old fence would apply.

BB. Conduct bank stabilization projects: These are reclamation projects designed to improve bank stability, improve the composition of native plant communities, reduce erosion into streams, and improve habitat for aquatic life. The streams or reaches of streams that would be included in streambank stabilization projects are those determined to be either Functioning at Risk or Non-Functioning.

Predictions: Bank stabilization would reduce sediment being delivered into the streams from exposed banks. Reduced sediment would result in healthier streams conditions and eventually reach a proper functioning condition rating for those at risk or in non-functioning condition.

Environmental activities associated with this action: Planting of riparian vegetation such as alder and willow, etc., sedges and other riparian species; placement of downed woody debris to protect plantings; placement of coir matting; and seeding of native grasses and forbs in a weed-free mix. Small excavators may be used to conduct these activities along with hand crews using chainsaws and other tools.

CC. Implement updated riparian grazing standards: Implementation of riparian grazing standards is designed to keep livestock bank trampling to within levels that allow the stream to recover from livestock use and improve over time. They are also designed to provide overall recovery and maintenance of the riparian vegetation. Methods used to measure alteration would be the accepted R1 protocols. These are expected to evolve as monitoring provides input to the process. The standard levels set for streambank alternation may also change as monitoring reveals that more or less stringent standards are needed to achieve improvements in stream form and function.

Predictions: Implementing these guidelines would reduce bank trampling to a level that would allow the streambank vegetation and other vegetation in the riparian area to recover each year from the effects of livestock. Recovery would be enough to incrementally improve conditions over time until the streams are functioning properly and the stream form and function has improved to its desired potential.

Environmental activities associated with this action: Field training of Forest Service personnel and permittees would take place. No other direct activities would occur.

DD. Construct water developments/water gaps: Water developments include water troughs. Water gaps are areas along streams where fences extend into a stream to allow livestock access. Water gaps are

designed to concentrate use in one area where damage can be controlled either by hardening the area, or restricting the amount of time livestock use a gap.

Predictions: More opportunities for livestock to water would reduce use of riparian areas, better distribute use in uplands and lead to better stream and riparian health and overall rangeland health.

Environmental activities associated with this action: Small excavators may be used to place rock and smooth or contour banks to the needed gradient to create a hardened area for livestock to stand on. Fences would be constructed to direct the livestock to the restricted water areas. All the actions associated with "V. Build or rebuild a fence" apply.

EE. Administer grazing permit to standard: Each year the District receives a target to administer a certain number of permits to standard. This means field confirmation of utilization, bank trampling, fence maintenance, and numbers of livestock, entry and exit of livestock. Not every allotment is administered to standard every year.

Predictions: Administering a permit to standard ensures that all the provisions in the permit are evaluated and compared to what actually occurred on the allotment.

Environmental activities associated with this action: Administering a permit to standard would include walking, riding horses, driving, use of ATVs to cover and inspect utilization, maintenance of improvements making sure livestock are in the proper pastures during the permitted time.

FF. Mechanical treatment: Mechanical treatment refers to such things as felling non commercial trees to remove conifer encroachment into rangelands, felling aspen to promote aspen suckering, or commercial logging.

Predictions: We are predicting that removing vegetation would perpetuate certain types of vegetation to better reflect historic population levels.

Environmental activities associated with this action: Use of chainsaws would be the most common tactic to remove vegetation. Trees would be either felled or girdled. Several persons could be engaged in the mechanical work at any one time. Transportation of crews into and out of the area in motor vehicles, including ATVs may take place. Noise associated with the activities could be expected to last several days to a few weeks depending upon the extent of the treatment. Note that any of these activities would require additional NEPA.

GG. Pick up old fence: Old fence is a hazard to the public and to wildlife and domestic animals. Fences no longer needed for control of livestock would be removed.

Predictions: Removing old fence would reduce safety hazards to humans, livestock and wildlife.

Environmental activities associated with this action: Vehicle use is associated with this activity. Helicopters may be used in those instances where fence is removed from remote locations. Fence dismantling can usually be done by hand with the actual removal of the materials being completed by pickup trucks, or ATVs, or horses.

HH. Close allotment: This would involve closing the allotment to livestock grazing.

Predictions: Closing the allotment would remove permitted livestock use from the area and allow natural processes to continue. We are predicting this would be favorable in some cases.

Environmental activities associated with this action: This may include economic impacts to the permittee. This would be especially true if the permittee still want to graze public lands and needs a permit to sustain their operation. Removal of fences would be completed along with removal of water developments. Fences and water developments are often removed with the aid of ATVs, horses, pickup trucks and occasionally helicopters. All these methods of transportation would create some level of disturbance. Old wooden fence posts may be left to rot or piled and burned. Formal closure requires a signed letter by the Forest Supervisor justifying the closure.

II. Public Education by signing at trailheads and gates: This would require posting signs at trailheads and other points of national forest access.

Predictions: The function of the signs is to reduce conflicts between recreationists and permittees resulting from open gates, downed fences, and other damaged improvements. We are predicting this would make a noticeable difference in the level of conflicts to the point that this is no longer conflict.

Environmental activities associated with this action: Activities include posting signs on existing kiosks, drilling post holes for placement of signs on wooden backing in areas where they would be visible to the public. This may cause some visual distractions on the landscape but signs would usually be places in areas where other signing already exists.

APPENDIX 3 Alternative 3 Monitoring Plan

Appendix 3 - Table 1.0. Monitoring Plan. This table displays how tracking and implementation of each monitoring item would be conducted. Items in bold would be monitored starting in 2008.

Items to be monitored at each interval	Type and Amount of Baseline Data	Type of sample method	Items Measured or Recorded and Standard for Taking Action	Frequency and Duration of Monitoring	Timing of monitoring	Appropriate spatial scales for monitoring different Items	Who is responsible for undertaking different aspects of monitoring
1. Erosion in uplands	Field sample/one year's data.	Recorded at long-term upland monitoring plots: Stratified random sample	Photo point, ocular 1/10 acre plot Includes: photo points, ocular estimates of % bare ground, soil rills or pedestals Action Required if: at least 15% of the plots indicate erosion.	5 year	Summer/Fall	Land-type association	District Rangeland Management Specialist, Forest Soils Scientist
2. Upland livestock distribution and utilization	***Existing historic records***	***Non-random: walk-through sampling areas of primary use areas***	***Residual stubble heights of native and non-native forage. BMP review conducted. Action by AMIT required if: Utilization exceeds 45%***	***Annual***	***Within two weeks of off date***	***Land-type association, allotment and 6th order HUC***	***District Rangeland Management Specialist***
3. Compliance with annual operating plan	***Existing historic records***	***Non-random sample of allotments. Walk-through and meetings with permittees***	***Determine if livestock are moved on time, check number, ownership, utilization, improvements, and conduct BMP review with permittee. Issue notice of noncompliance for violations. Take immediate action on resource threats, trespass, or ownership violations. Work with permittee on other problems.***	***Annually on allotments with high use every three years on others***	***Throughout the grazing season***	***Allotment and 6th order HUC***	***District Rangeland Management Specialist***
4. Number of functioning range improvements	***Field sample/one year***	***Non-random sample***	***Rate as good, fair, poor, or non-functioning. .BMP review conducted. Document functioning and nonfunctioning improvements and provide info to permittee. If these are not brought up to standard it may result in cancellation of the permit.***	***No minimum established Nationally but put inspections on a schedule***	***Spring/Summer/ Fall***	***Individual Allotments***	***District Rangeland Management Specialist***
5. Trend in Aspen stand structure, function, and composition	Field data collect once prior to treatment	Stratified non-random sample	FS Common Stand Exam protocol. Provide data needs to Forest Ecology Group. Prioritize all non regenerating stands for treatment	Collect post treatment data for 5 years	Summer/Fall	Stand and landscape scale	Gallatin Forest Silviculturist

Items to be monitored at each interval	Type and Amount of Baseline Data	Type of sample method	Items Measured or Recorded and Standard for Taking Action	Frequency and Duration of Monitoring	Timing of monitoring	Appropriate spatial scales for monitoring different Items	Who is responsible for undertaking different aspects of monitoring
6. Trend in Upland Plant community composition	***Reread long term monitoring plots***	***Non random sample***	***Nested rooted frequency, range checklist, repeat photos, conduct BM. Three readings of grazing-related adverse trend require action by District Ranger***	***Reread every 3 years***	***Summer/Fall***	***Stand and landscape***	***District Rangeland Management Specialist***
7. Redd Trampling	***Field sample/ 3 year baseline***	***Non-random Sample of fish-bearing streams with trampling standards***	***Fish electro shocking and mark recaptures to monitor population and age trends for fish. Amphibian ocular counts of adults. Adverse trend requires action by District Ranger***	***Every year starting 2009 until trends are determined***	***Summer***	***Individual Streams and 6th order HUC***	***District Fisheries Biologist***
8. Stream Channel form and function	***Field sample/one year***	***Non-random Long-term stream monitoring points***	***PFC, Pfankuch, Rosgen stream departure, Wolman pebble count, 50 bank-full widths, residual pool depth. Any adverse trend requires immediate action by District Ranger to reverse trend***	***Every 5 years***	***Mid-Summer/Fall***	***Individual Streams and 6th order HUC scale***	***Forest Hydrologist and District Fisheries Biologist***
9. Streambank Alteration (bank trampling)	***Field sample/one year***	***Non-random sample conducted by District and permittee***	***Follow most recent Region 1 protocols. Standards for action depend on protocol used. B-D standard for cutthroat streams in 19%. Permittee must start moving livestock before standard is met***	***Bi-monthly***	***Summer/Fall***	***Key areas on Individual Streams***	***District Rangeland Management Specialist and Permittees***
10. Riparian vegetation health	***Field sample/one year***	***Random Sample***	***Protocol is evolving. Use the most currently accepted protocol. Any adverse trend requires immediate action by District Ranger to reverse trend***	***Every 5th year with channel form and function***	***Mid-Summer/Fall***	***Individual streams and 6th order HUC scale***	***District Rangeland Management Specialist***
11. Macro invertebrate populations and species composition	Field sample/ one year baseline	Random Sample for long-term monitoring points	Measure those macro invertebrate Indices that are sensitive to livestock grazing. Any adverse trend requires immediate action by the District Range to reverse trend	Every 5 years	Summer/Fall	Individual Streams	District Fisheries Biologist
12. Bird community composition	Field sample/ one year baseline	Non-random Sample	Northern Region Landbird Monitoring Protocol. Adverse and positive trends provide to Landbird monitoring records	Every 5th year with channel form and function	Spring	Landscape/ Regional	District Wildlife Biologist
13. Economic Impacts on the permittee	***Office sample/one year***	***Non random Sample***	***B/C ratio and PNV for individual projects if needed. Consult with permittee on all. Work thru adverse impacts with permittee to reduce effects.***	***Review each improvement***	***Winter/Spring***	***Individual Allotment***	***District Rangeland Management Specialist and District Ranger***

Appendix 3 - Table 2.0. Monitoring Data Analysis and Tracking. This table displays how the data would be analyzed and stored and who would interpret the data.

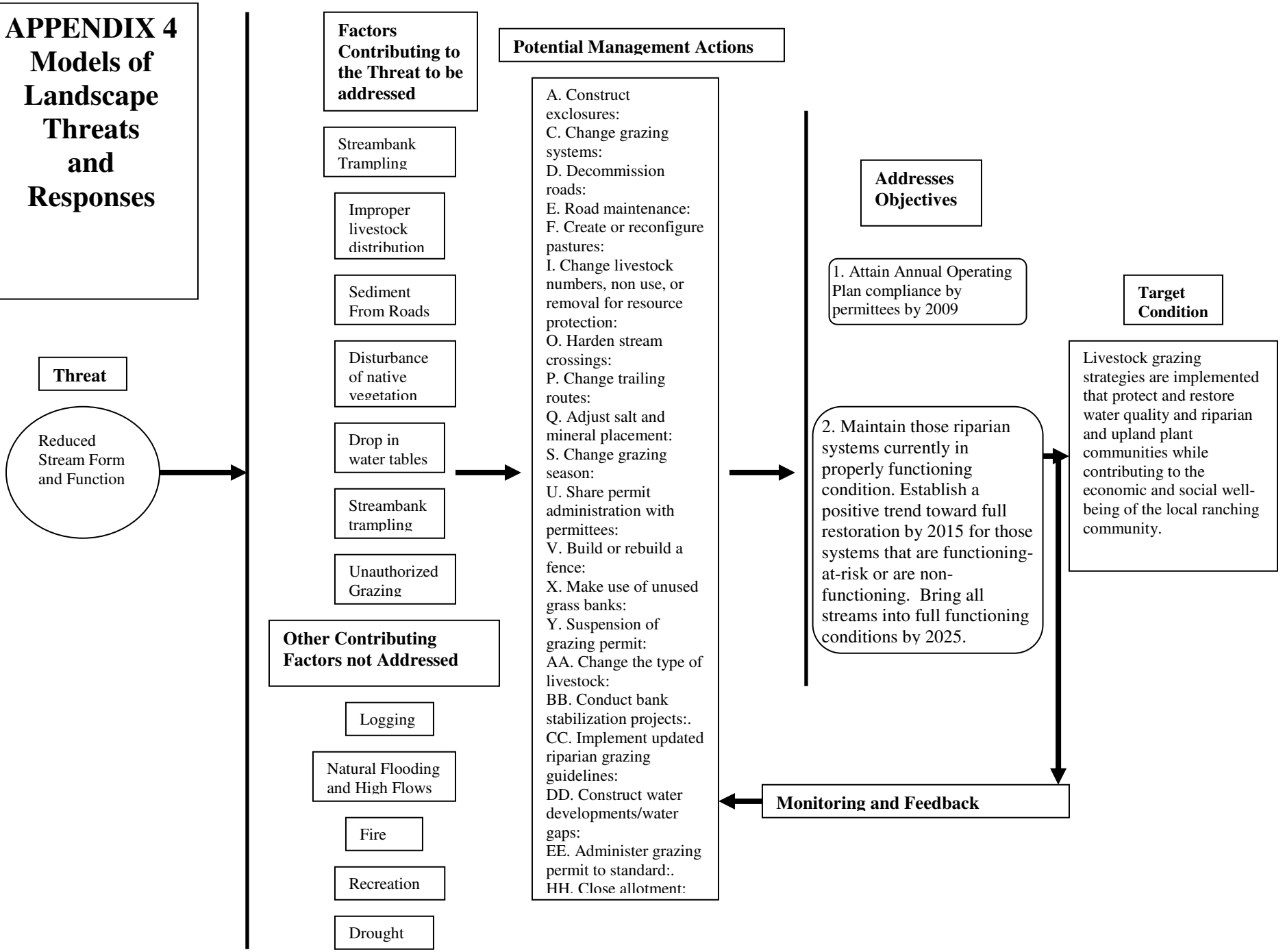
Items	**Methods(s) used to analyze data**	**System for managing data over the long term (e.g., storage, analysis, access).**	**Who will interpret data and who will have access to it (in general all Forest employees have access to all data on the Forest)**
1. Erosion in uplands	Professional judgment by Range Specialist based on visual observations and recorded data. Consult with Forest Soils Scientist on all findings. Provide data to AMIT for review.	Electronic file and hard copy placed in 2210 District Range Files.	AMIT with help of Forest Soil Scientist. All Forest employees will have access to the data.
2. Upland livestock distribution and utilization*	***Simple comparison of the stubble height measurements with the utilization guidelines. AMIT reviews findings to determine course of action if any.***	***Electronic file and hard copy placed in 2210 District Range Files.***	***District Range Specialist provides data annually to the AMIT. All Forest employees and permittees have access to the data.***
3. Compliance with annual operating plan*	***Office review of field data. Items are field checked for compliance and Range Specialist compares with AOI and provides info to District Ranger and AMIT.***	***Electronic file and hard copy placed in 2210 District Range Files.***	***District Range Specialist provides data annually to the AMIT. All Forest employees and permittees have access to the data.***
4. Number of functioning range improvements*	***Office review of field data between Range Specialist and Ranger. Findings are provided to the permittee. Permittees provide feedback on problem improvements.***	***National INFRA Database***	***District Range Specialist provides data annually to the AMIT. All Forest employees and permittees have access to the data.***
5. Trend in Aspen stand structure, function, and composition	Stand Exam data is reviewed by a certified silviculturist and they make recommendations to AMIT and Ranger. Statistics and stand data generated by the FSVEG program.	Tracked in NRIS – FSVEG	AMIT plus certified silviculturist. Data will be accessible to anyone with access to NRIS.
6. Trends in Upland Plant community composition*	***Data analysis would be compiled from nested rooted frequency plots. This would be compared to the Range Health Checklist and similarity tables to determine trend. Data would be provided to the permittee and the AMIT***	***Tracked in NRIS – TERRA database***	***AMIT with the help of MSU and/or the Regional Ecologist. Data will be accessible to anyone with access to NRIS.***
7. Redd trampling*	***Fish: Electro shocking to monitor population and age trends for fish. Statistical analysis to determine significance Amphibians: Population counts are compared to previous data.***	***NRIS WATER/FUANA database, Montana Natural Heritage Program database***	***District and Forest Fisheries Biologist will interpret data then provide that data to the AMIT.***
8. Stream Channel form and function*	***PFC rating is compared to previous ratings: Pfankuch is compared to the Forest Plan Standard; Rosgen stream classification is compared to reference conditions; Wolman pebble count, 50 bank-full widths and residual pool depth are compared to previous measurements to establish trends.***	***NRIS – WATER Database***	***AMIT will interpret the data. Anyone with access to NRIS will have access to the data.***

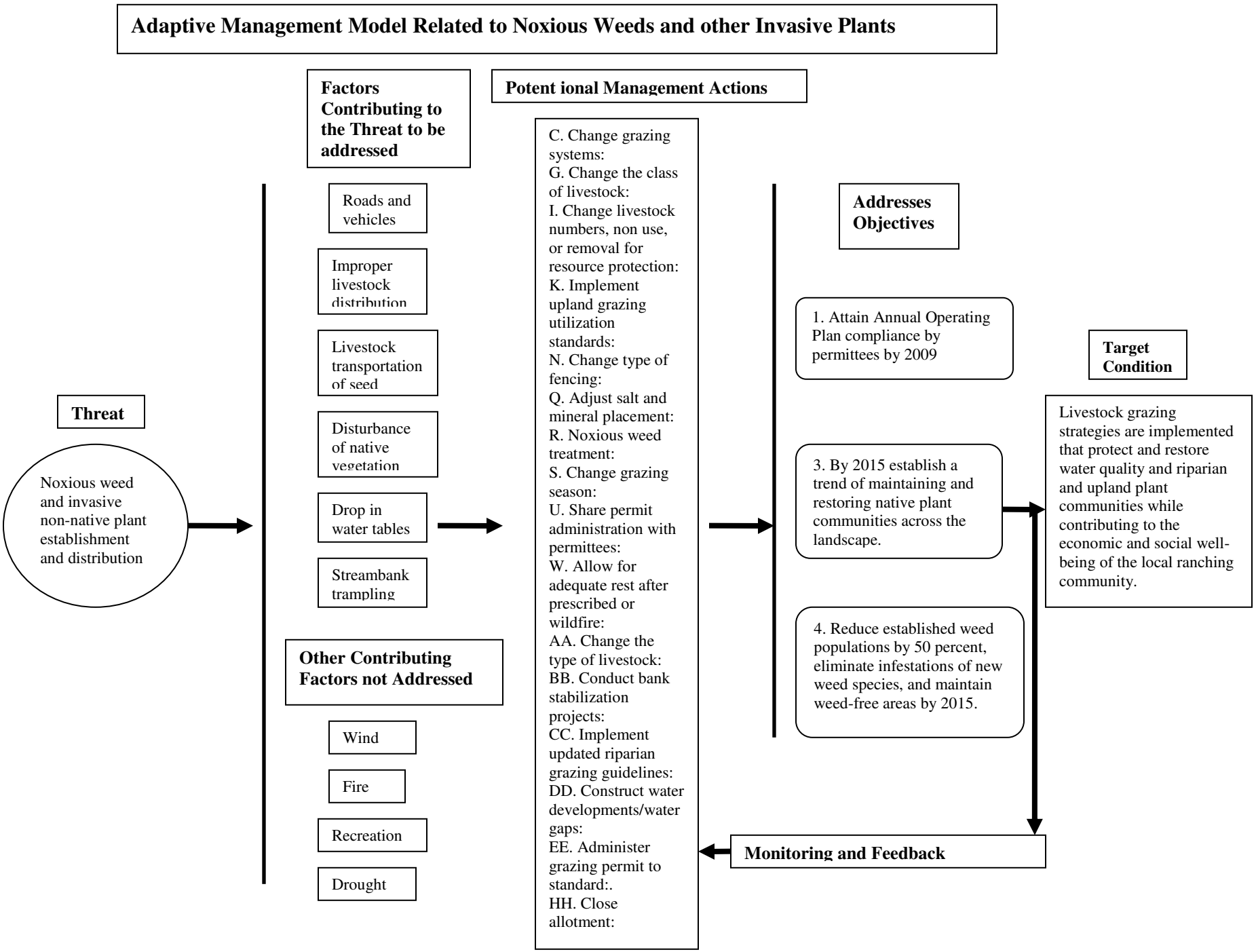
Items	**Methods(s) used to analyze data**	**System for managing data over the long term (e.g., storage, analysis, access).**	**Who will interpret data and who will have access to it (in general all Forest employees have access to all data on the Forest)**
9. Streambank Disturbance*	***Follow most recent Region 1 protocols. Measurements are compared to the trampling guideline to determine if guideline is being met. Findings are provided to the Ranger and the AMIT***	***Electronic file and hard copy placed in 2210 District Range Files.***	***District Rangeland Management Specialist then provides data annually to the AMIT. Data will be available all Forest employees.***
10. Riparian vegetation health*	***Protocol is evolving. Use the most currently accepted protocol. Findings are provided to the Ranger and the AMIT***	***Hard copy files with monitoring data.***	***AMIT with help of the Regional Ecologist***
11. Macro invertebrate populations and species composition	Samples are compiled and specific indices are compared to stream conditions. Findings are provided to the Ranger and the AMIT	Hard copy files with monitoring data.	District and Forest Fisheries Biologist
12. Bird community composition	District Biologist compares data from previous years to establish trends. Findings are provided to the Ranger and the AMIT	Hard copy files with monitoring data. Data entered into National Heritage Database	District Wildlife Biologist with help of Research Station
13. Economic Impacts on the permittee*	***District Resource Assistant and Range Specialist would review the economics and the practicality of project implementation. Findings are provided to the Ranger and the AMIT***	***Hard copy in District files.***	***District Rangeland Management Specialist provides feedback to the permittee. Data is provided annually to the AMIT.***

*These items would be monitored beginning in 2009.

APPENDIX 4 Models of Landscape Threats and Responses

Adaptive Management Model Related to Stream Form and Function




Adaptive Management Model Related to Noxious Weeds and other Invasive Plants
Threat
Noxious weed and invasive non-native plant establishment and distribution
Factors Contributing to the Threat to be addressed
Roads and vehicles
Improper livestock distribution
Livestock transportation of seed
Disturbance of native vegetation
Drop in water tables
Streambank trampling
Other Contributing Factors not Addressed
Wind
Fire
Recreation
Drought
Potent ional Management Actions
C. Change grazing systems:
G. Change the class of livestock:
I. Change livestock numbers, non use, or removal for resource protection:
K. Implement upland grazing utilization standards:
N. Change type of fencing:
Q. Adjust salt and mineral placement:
R. Noxious weed treatment:
S. Change grazing season:
U. Share permit administration with permittees:
W. Allow for adequate rest after prescribed or wildfire:
AA. Change the type of livestock:
BB. Conduct bank stabilization projects:
CC. Implement updated riparian grazing guidelines:
DD. Construct water developments/water gaps:
EE. Administer grazing permit to standard:.
HH. Close allotment:
Addresses Objectives
1. Attain Annual Operating Plan compliance by permittees by 2009
3. By 2015 establish a trend of maintaining and restoring native plant communities across the landscape.
4. Reduce established weed populations by 50 percent, eliminate infestations of new weed species, and maintain weed-free areas by 2015.
Target Condition
Livestock grazing strategies are implemented that protect and restore water quality and riparian and upland plant communities while contributing to the economic and social well-being of the local ranching community.
Monitoring and Feedback

Adaptive Management Model Related to Riparian Vegetative